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United States Department of Agriculture

Forest Service

North Central Forest Experiment Station

Resource Bulletin **NC-141**

Minnesota Forest Statistics, 1990

Patrick D. Miles and Chung M. Chen

This report includes the most commonly used Forest Inventory and Analysis statistics. Additional forest resource data can be provided to interested users. Persons requesting additional information from the raw inventory data are expected to pay the retrieval costs. These costs range from less than $100 for a relatively simple request to $2,000 for a complex retrieval involving the services of a Forest Inventory and Analysis computer programmer. Requests will be filled so as to minimize the impact on the Forest Inventory and Analysis Work Unit.

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1992 Folwell Avenue
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Manuscript approved for publication August 19, 1992
1992

FOREWORD

The fifth inventory of Minnesota was directed by Neal P. Kingsley, Forest Inventory and Analysis (FIA) project leader. David F. Heinzen, supervisor of the Minnesota Department of Natural Resource's (DNR) Resource Assessment Analysis Program, was responsible for overseeing all DNR personnel and contract field crews. Jerold T. Hahn and Mark H. Hansen were responsible for inventory design. Arnold (Jerry) Ostrom supervised the FIA field crews, which were reponsible for collecting field data in the Central Hardwood and Prairie Survey Units and in part of Itasca County. Steve Flackey of the Minnesota DNR supervised the field crews that collected data in the Aspen-Birch and Northern Pine Survey Units. Elizabeth C. Collins supervised FIA's photo interpretation staff, and George Deegan of the Minnesota DNR was responsible for supervising State photo interpreters.

FIA field crew members:
Nancy Ady, Karen Brand, Becky Bryan, John Bryan, Michael Burns, Paul Castillo, Mark Dilley, John DuPlissis, Loren Eide, Jay Flynn, Mark Hamel, Cheri Hartless, Patrick Hartless, Robert Haukereid, Douglas Hecker, Glenda Hefty, Gary Inhelder, Peter Koehler, Gary Larson, William Nelson, William Peters, Ron Piva, Lois Poppert, Loren Poppert, Ed Rumbold, Nicholas Severson, Jerry Van Cleve, Linda Weidel, Dan Wendt

FIA field crew clerk typist:
Monica Van Cleve

Minnesota DNR field crew members:
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Minnesota DNR field crew clerk typist:
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Contracting field crew members:
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Training provided by Minnesota DNR disease and insect specialists increased the accuracy of tree class determination. These classifications now more accurately reflect the utilization of aspen and several other species. Training of field crews was

done by Michael Albers, Jana Albers, and Ed Hayes. Tom Eiber and Alan Jones were responsible for the development of standardized disease and damage codes.

FIA photo interpreters:
Rose Berg, Elizabeth Collins, Julie Fleming, Dale Gormanson, Mark Johnson, Barbara Knight, Leo Larkin, Jay Solomakos, Mark Springen

Minnesota DNR photo interpreters:
Marty Casselius, George Deegan, John Falkner, Steve Flackey, Valiree Hanson, Craig Mellin, Greg Russell, Scott Seeley

Patrick D. Miles and Mark H. Hansen were responsible for generating area, volume, growth, and removals tables. William (Brad) Smith and Ronald L. Hackett collected and compiled data on timber product outputs and timber removals. Pat Murray and Jay Solomakos edited the data, and Mary Jo Resendez prepared the tables for printing.

Mary Jean Hanson and Daniel S. Goodman provided administrative and secretarial support. Computer support was provided by Gerhard K. Raile.

Forest Inventory and Analysis (FIA) is a continuing endeavor as mandated by the Renewable Resources Research Act of 1978. Prior inventories were mandated by the McSweeney-McNary Forest Research Act of 1928. The objective of FIA is to periodically inventory the Nation's forest land to determine its extent, condition, volume of timber, growth, and removals. Up-to-date resource information is essential to frame forest policies and programs. USDA Forest Service regional experiment stations are responsible for conducting these inventories and publishing summary reports for individual States. The North Central Forest Experiment Station is responsible for forest inventory and analysis in Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, and Wisconsin.

Fieldwork for the fifth Minnesota forest inventory was begun in April 1986 and completed in February 1991. Reports of the four previous inventories of Minnesota's timber resource are dated 1936, 1953, 1962, and 1977.

More accurate survey information was obtained during this survey than otherwise would have been feasible because of intensified field sampling. Such sampling was made possible through the cooperation and assistance of the Minnesota DNR. Data for the Aspen-Birch and Northern Pine Survey Units were collected by contract crews hired and supervised by the Minnesota DNR. The DNR installed several hundred additional plots on national forest land. These efforts increased the sampling intensity on national forest lands from a single intensity level to the triple intensity level of the rest of the State. Data for the Central Hardwood and Prairie Units were collected by FIA. To aid in determining current timber removals, the Minnesota DNR also surveyed primary wood-using plants in the State.

Aerial photos used in the forest inventory were purchased by the State from the U.S. Geological Survey. This photography was from the National High Altitude Photography program (NHAP). In addition, the Minnesota DNR provided 35mm true color prints at a scale of 1:15,840 of all of the 1977 plot locations for disturbance detection.

Minnesota Forest Statistics, 1990

Patrick D. Miles and Chung M. Chen

HIGHLIGHTS

NOTE: *Data from new forest inventories are often compared with data from earlier inventories to determine trends in forest resources. However, for the comparisons to be valid, the procedures used in the two inventories must be similar. As a result of our ongoing efforts to improve the efficiency and reliability of the inventory, several changes in procedures and definitions have occurred since the last Minnesota inventory in 1977. Because some of these changes will make it inappropriate to directly compare the 1990 data with those published for 1977, data from the 1977 inventory have been reprocessed using the 1990 procedures. Please refer to the section labeled "Comparing Minnesota's Fifth Inventory With the Fourth Inventory" for more details.*

General

Minnesota is divided into four survey units (fig. 1), and separate statistical reports have been published for each unit. Unit boundaries roughly align with the three broad ecoregions in Minnesota. The Aspen-Birch and Northern Pine Survey Units in the north contain most of the State's boreal forest. The Central Hardwoods Survey Unit in the southeast is dominated by hardwoods. And the Prairie Survey Unit in the west, once open prairie, is now nearly 85 percent cropland.

Patrick D. Miles, Programmer Analyst, received a bachelor's degree in forestry in 1981 and a master's degree in forest economics in 1984 from the University of Minnesota. He joined the Forest Service in 1984 and has been with the Forest Inventory and Analysis Unit since 1989.

Chung M. Chen, Senior Research Analyst for the Minnesota DNR, received a bachelor's degree in forestry from Taiwan National Chungsing University, a master's degree from Yale, and a Ph.D. from the University of Minnesota.

The geology and soils of the northern two-thirds of the State are largely the result of glaciation. The flat area in the northwest corner of the State was once the basin of ancient Lake Agassiz. Bare bedrock and shallow soils in the northeast show the scars left by advancing and retreating glaciers. The sandy gravelly soils of parts of central Minnesota, along with potholes, drumlins, and morraines, are additional evidence of these recent geologic events. Southeastern Minnesota, largely untouched by glaciation, has a much older landscape. The valleys and bluffs in the southeast have been etched out over a much longer time period. Rivers, periodically filled to overflowing by glacial runoff, have carved valleys and bluffs from sedimentary layers deposited in ancient seas.

Forest Area

- The total land area of Minnesota is 51.0 million acres, of which 33 percent is forested. The area of all forest land in the State has increased by 0.7 percent since 1977 to 16.7 million acres. The current forest area includes 1.1 million acres of reserved forest land where harvesting is prohibited by statute or administrative designation. The largest area of reserved forest land (1.0 million acres) is in the Aspen-Birch Survey Unit, primarily the Boundary Waters Canoe Area Wilderness and Voyageurs National Park.

- There were 14,773,400 acres of timberland in the State in 1990, an 8.5-percent increase from 1977. Just over half of this increase came from the reclassification of unproductive forest land to timberland in 1990. Survey plots with a low site index (under 15 for northern white-cedar, 20 for black spruce and tamarack, and 25 for eastern redcedar; under 35 for all other species) were classified as unproductive forest land in 1977. Improved site index curves used in the 1990 survey placed many of these plots in the timberland category. The large increase in the black spruce and tamarack types in the

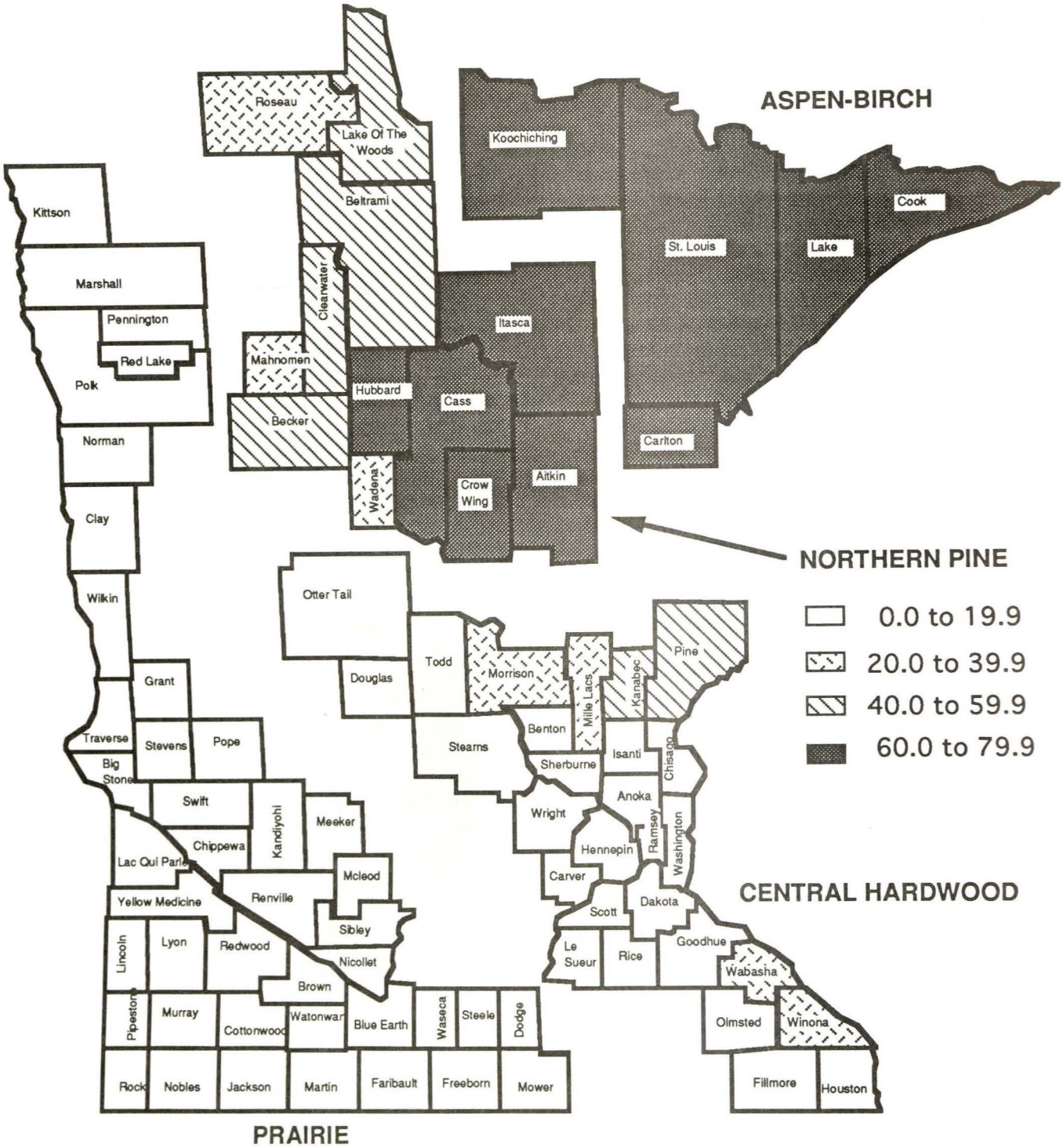

Figure 1.—*Forest land as a percent of land area by county, Minnesota, 1990.*

Aspen-Birch Unit is due mainly to these new site index curves. Another two-fifths of this increase can be attributed to the conversion of cropland or marshland to timberland.

- The highest concentration of timberland is in the northeastern Minnesota (fig. 1). Of the four units, the Aspen-Birch Unit has the highest percentage of area in timberland (68 percent). The Northern Pine Unit is second with 54 percent timberland followed by the Central Hardwood Unit with 19 percent and the Prairie Unit with only 3 percent. The highest concentration of forest industry (pulp, saw and fiberboard mills) is also in the north[1]. The Central Hardwood Unit, with 64 percent of the State's oak-hickory forest type, also plays an important role in the State's timber economy. Forest areas in the Prairie Unit are widely scattered but are important for recreation, wildlife, and soil stabilization.

- State, county, and municipal governments administer 37.8 percent of the 14.8 million acres of timberland in Minnesota (fig. 2). Farmers and other private owners control 43.5 percent.

- The area of sawtimber stands increased from 26 percent of the timberland area in 1977 to 33 percent in 1990 as poletimber stands grew into the sawtimber size class. The proportion of area in sapling-seedling stands also increased by approximately 7 percent, from 23 percent of timberland area in 1977 to 30 percent in 1990. This increase is attributable to the harvesting and subsequent regeneration of sawtimber and poletimber stands.

- Stocking on timberland areas improved slightly between survey periods. In 1977 approximately 74 percent of timberland was moderately to well stocked. By 1990 this had increased to 78 percent.

- More than one-third of the timberland in Minnesota is in the aspen forest type (fig. 3), a

[1] *Smith, W. Brad; Dahlman, Rick. 1988. Minnesota timber industry—an assessment of timber product output and use, 1988. Resour. Bull. NC-127. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 61 p.*

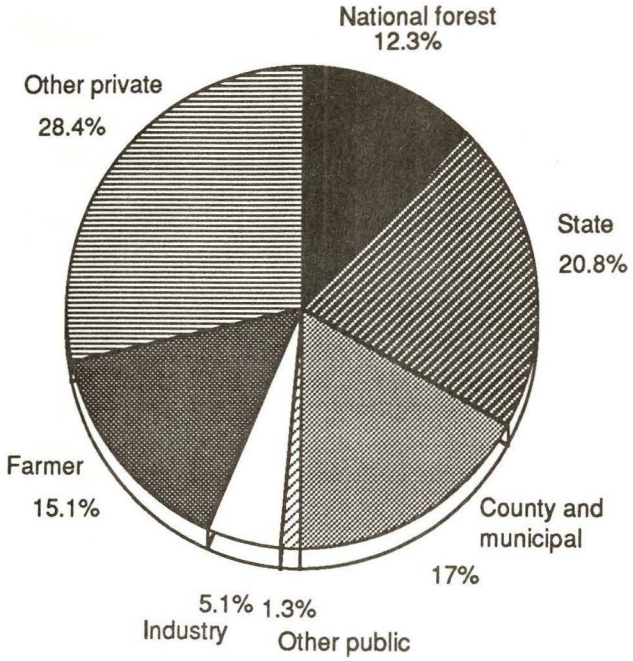

Figure 2.—*Distribution of timberland by ownership, Minnesota, 1990.*

proportion that remained relatively constant between the two surveys. The area in black spruce and northern white-cedar types has increased by 25 percent, and the area of tamarack has increased by more than 40 percent. These increases are due in large part to the reclassification of unproductive forest land to marginally productive land in 1990.

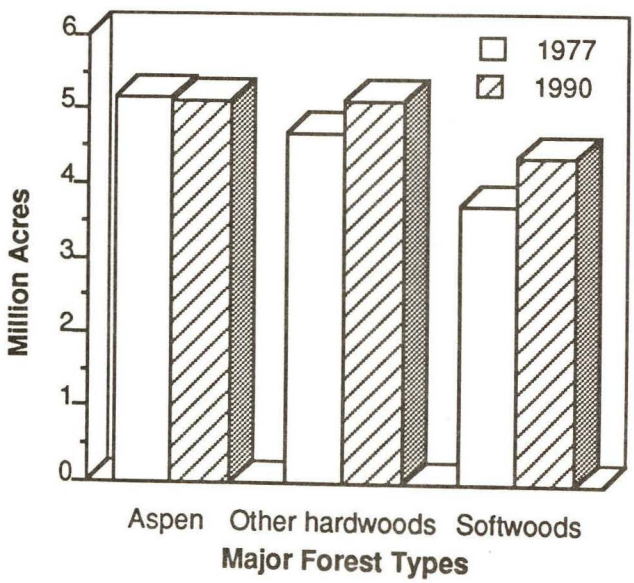

Figure 3.—*Area of timberland in Minnesota by major forest type group, 1977 and 1990*

Number of Trees

- In 1990 there were more than 2 billion growing-stock trees 5 inches and larger in diameter in Minnesota, an increase of nearly 10 percent from that reported in 1977. The number of trees between 1 and 5 inches in diameter increased by 26 percent between 1977 (4.4 billion) and 1990 (5.6 billion).

Volume

- Growing-stock volume increased from 12.4 billion cubic feet in 1977 to 15.1 billion cubic feet in 1990—a gain of 22 percent (fig. 4). During the same period, sawtimber volume increased from 24.3 billion board feet to 34.8 billion board feet, up 43 percent.

- Growing-stock volume per acre increased from 909 cubic feet to 1,022 cubic feet between inventories. During the same period, sawtimber volume per acre increased from 1,787 to 2,356 board feet.

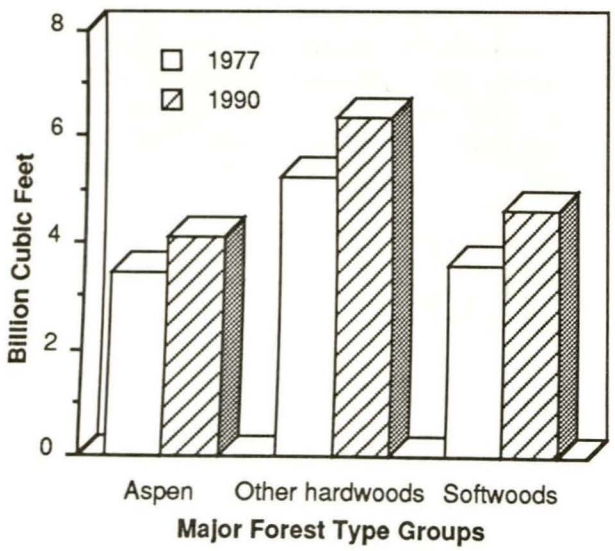

Figure 4.—*Growing-stock volume by major forest type groups, Minnesota, 1977 and 1990.*

- Fifty-one percent of the growing-stock volume in Minnesota is on public lands (fig. 5). State and local governments administer 36 percent, the Chippewa and Superior National Forests administer 14 percent, and other public agencies administer 2 percent. Private ownership of growing-stock volume is split between miscellaneous private owners (29 percent), farmers (15 percent), and forest industry (4 percent).

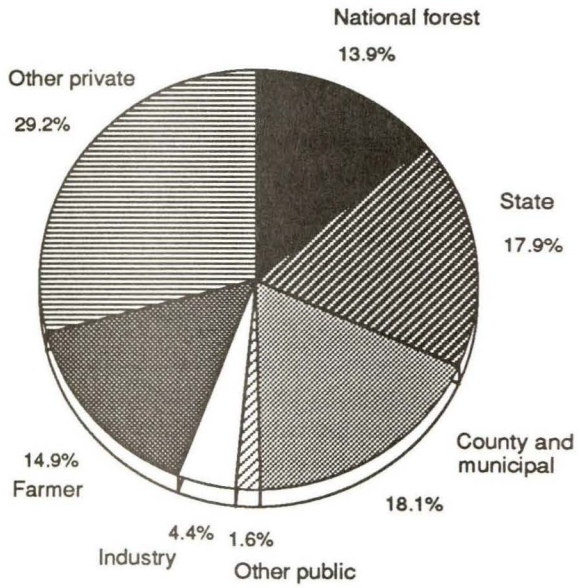

Figure 5.—*Growing-stock volume by ownership group, Minnesota, 1990.*

- Hardwoods comprise 69 percent of the growing-stock volume in Minnesota, or about 10.5 billion cubic feet. Aspen (quaking and bigtooth) is the largest component of hardwoods, totaling 4.1 billion cubic feet or 39.1 percent of hardwood volume (fig. 6). Softwoods account for the other 31 percent of total timber volume. Spruce and fir are the largest constituent at 43 percent of softwood volume.

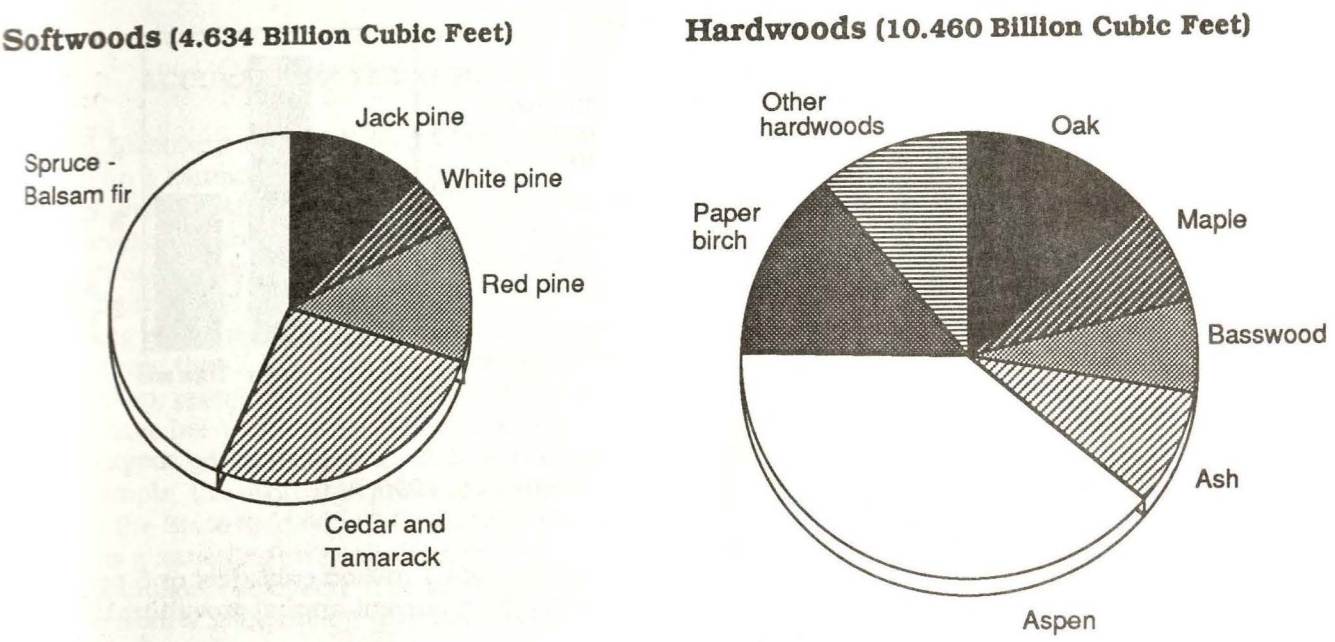

Figure 6.—*Growing-stock volume by species group, Minnesota, 1990.*

Timber Growth, Mortality, and Removals

- Annual growth, removals, and mortality are often reported as a percentage of the current inventory. Because of the 13 years between surveys, this can lead to deceptive results. As an example, average annual mortality of elm from 1977 to 1989 was 25.9 million cubic feet. Total volume of elm over that same period fell from 541.7 million cubic feet in 1977 to 268.1 million cubic feet in 1990. When average annual mortality of elm is expressed as a percentage of the 1990 inventory, the mortality rate is 9.7 percent, but when it is expressed as a percentage of the 1977 inventory, the mortality rate is 4.8 percent. If we assume that the mortality rate has been constant over the period, we would get a mortality rate of 5.3 percent per year. In short, average annual changes as a percent of the 1990 inventory are interesting for comparison purposes, but they should not be used for inferring future trends.

- Net annual growth of growing stock on timberland averaged 368.0 million cubic feet per year between 1977 and 1989, an average of 24.9 cubic feet of growth per acre per year, or 2.4 percent of the 1990 inventory.

- Average net annual growth for softwoods was 112.7 million cubic feet during the period from 1977 to 1989, or 2.4 percent of the 1990 softwood inventory (fig. 7). Hardwood average net annual growth was 255.3 million cubic feet—2.4 percent of the 1990 hardwood inventory. Almost half of the hardwood growth was in aspen. Average annual growth of aspen was 123.4 million cubic feet, or 3.0 percent of inventory. Other hardwoods had an average annual growth of 131.9 million cubic feet—2.1 percent of the 1990 inventory.

- Growing-stock mortality on timberland averaged 219.2 million cubic feet per year from 1977 to 1989, an average of 1.5 percent of the 1990 inventory.

- Annual removals of growing stock from timberland during the period from 1977 to 1989 averaged 210.1 million cubic feet. Softwood removals averaged 54.9 million cubic feet per year (48.7 percent of growth) (fig. 7). Average annual aspen removals was 85.8 million cubic feet (69.6 percent of growth) over this period. Other hardwood removals averaged 69.3 million cubic feet (52.5 percent of growth).

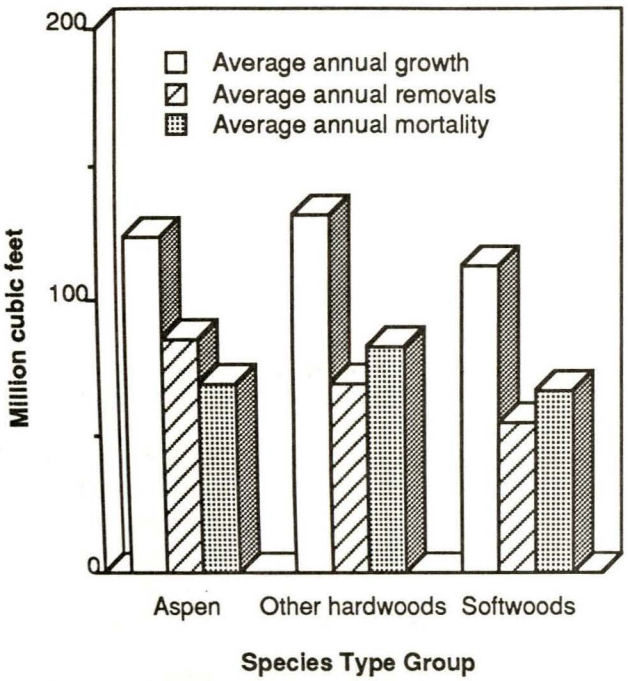

Figure 7.—*Average annual growing-stock growth, removals, and mortality on timberland, Minnesota, 1977-1989.*

- Current annual growth of growing stock on timberland was 451.3 million cubic feet in 1989, 2.9 percent of the 1990 inventory. Current growth for 1989 was 30.6 cubic feet per acre, 23 percent higher than average annual growth. Current annual growth per acre may be higher than average annual growth due to the accelerating growth of young stands now replacing the slowing growth of decadent old stands.

- Total current annual removals of growing stock on timberland in 1988 came to 260.8 million cubic feet. Aspen removals in 1988

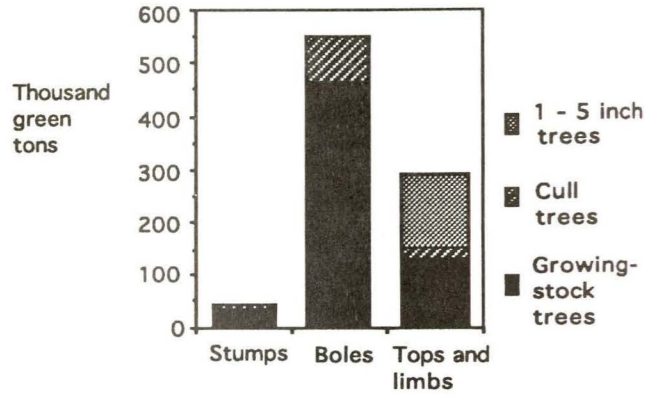

Figure 8.—*All live tree biomass by component, Minnesota, 1990.*

totaled 144.1 million cubic feet or 5 percent more than current annual growth in 1989.

Biomass

- All live tree biomass (trees at least 1 inch in diameter) on timberland averaged 59.8 green tons per acre in 1990. Seventy-one percent of the live tree biomass was in growing-stock trees. Cull trees accounted for 13.4 percent of the biomass, and trees between 1 and 5 inches in diameter accounted for the remaining 15.6 percent (fig. 8).

- The average biomass of tall and low shrubs (including trees less than 1 inch d.b.h.) in Minnesota was 2,937 pounds green weight per acre. Average biomass ranged from a high of 5,037 pounds per acre for the paper birch forest type to a low of 626 pounds per acre for the white spruce forest type.

APPENDIX

ACCURACY OF THE SURVEY

Forest Inventory and Analysis information is based on a sampling procedure designed to provide reliable statistics at the State and Survey Unit levels. Consequently, the reported figures are estimates only. A measure of reliability of these figures is given by sampling errors. These sampling errors mean that the chances are two out of three that if a 100-percent inventory had been taken, using the same methods, the results would have been within the limits indicated.

For example, the estimated growing-stock volume in the State in 1990, 15,094.0 million cubic feet, has a sampling error of ±0.71 percent (±107.2 million cubic feet). The growing-stock volume from a 100-percent inventory would be expected to fall between 14,986.8 and 15,201.2 million cubic feet (15,094.0 ± 107.2), there being a one in three chance that this is not the case.

The following tabulation shows the sampling errors for the Minesota Forest Inventory:

Item	State totals	Sampling error
Growing-stock	(Million cubic feet)	(Percent)
Volume (1990)	15,094.0	0.71
Average annual growth (1977-1989)	367.1	1.30
Average annual removals (1977-1989)	207.6	4.86
Sawtimber	(Million board feet)	
Volume (1990)	34,810.5	1.02
Average annual growth (1977-1989)	1,310.4	1.45
Average annual removals (1977-1989)	515.4	6.03
Timberland area (1990)	(Thousand acres) 14,773.4	0.36

As survey data are broken down into sections smaller than State totals, the sampling error increases. For example, the sampling error for timberland area in a particular county is higher than that for total timberland area in the State. This tabulation shows the sampling errors for State totals. To estimate sampling error for data smaller than State totals, use the following formula:

$$E = \frac{(SE)\sqrt{\text{(State total volume or area)}}}{\sqrt{\text{(Volume or area smaller than State total)}}}$$

where:

E = sampling error in percent
SE = State total error for volume or area

For example, to compute the error on the area of timberland in the aspen type for the State, proceed as follows:

The total area of aspen type in the State from table 3 = 5,114,200 acres

The total area of all timberland in the State from table 3 = 14,773,400 acres

The State total error for timberland area from the above tabulation = 0.36 percent

Using the above formula:

$$\text{Error} = \frac{(0.36)\sqrt{14{,}773{,}400}}{\sqrt{5{,}114{,}200}}$$

$$= \pm 0.61 \text{ percent}$$

County Data

A standard FIA inventory is designed to provide sampling errors of 3 percent per million acres of timberland or an overall error on Minnesota's nearly 15 million acres of about 0.36 percent. The State of Minnesota funded the collection of additional field data that would reduce the sampling error by one-half. The goal was to provide a sampling error of less than 10 percent for total timberland area by county.

The sampling error within a county depends on county size and total area of timberland. Many large, heavily forested counties in the State have sampling errors well below 5 percent. However in counties where timberland area is less than 35,000 acres, sampling errors generally exceed 10 percent. This is often the case in the Prairie and Central Hardwood Survey Units. For this reason some of the counties in these units were grouped in this report to provide reporting areas with sampling errors of less than 10 percent (fig. 9). The sampling error for total timber volume in a reporting area containing 35,000 acres of timberland will be about 20 percent. Individual county data for the Prairie and Central Hardwood Survey Units are provided only in table 1. All other tables reporting county level information use the county or county group names displayed below.

Unit	County	County grouping
Aspen-Birch	Carlton	(for Aspen-Birch and Northern Pine
	Cook	Units there are no county groupings)
	Koochiching	
	Lake	
	St. Louis	
Northern Pine	Aitkin	
	Becker	
	Beltrami	
	Cass	
	Clearwater	
	Crow Wing	
	Hubbard	
	Itasca	
	Lake of the Woods	
	Mahnomen	
	Roseau	
	Wadena	
Central Hardwood	Anoka	Anoka-Dakota-Ramsey-Washington
	Benton	Benton-Sherburne
	Carver	Carver-Hennepin-Scott
	Chisago	Chisago-Isanti
	Dakota	Anoka-Dakota-Ramsey-Washington
	Douglas	Douglas-Todd
	Fillmore	Fillmore-Olmsted
	Goodhue	
	Hennepin	Carver-Hennepin-Scott
	Houston	
	Isanti	Chisago-Isanti
	Kanabec	
	Le Sueur	Le Sueur-Rice
	Mille Lacs	
	Morrison	
	Olmsted	Fillmore-Olmsted
	Otter Tail	
	Pine	
	Ramsey	Anoka-Dakota-Ramsey-Washington
	Rice	Le Sueur-Rice

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Unit	County	County grouping
	Scott	Carver-Hennepin-Scott
	Sherburne	Benton-Sherburne
	Stearns	
	Todd	Douglas-Todd
	Wabasha	
	Washington	Anoka-Dakota-Ramsey-Washington
	Winona	
	Wright	
Prairie	Big Stone	Western
	Blue Earth	Blue Earth-Faribault
	Brown	Southern
	Chippewa	Western
	Clay	Clay-Norman
	Cottonwood	Eastern
	Faribault	Blue Earth-Faribault
	Freeborn	Eastern
	Grant	Western
	Jackson	Southern
	Kandiyohi	Kandiyohi-Meeker
	Kittson	
	Lac qui Parle	Western
	Lincoln	Western
	Lyon	Western
	McLeod	Northern
	Marshall	
	Martin	Southern
	Meeker	Kandiyohi-Meeker
	Mower	Eastern
	Murray	Western
	Nicollet	Northern
	Nobles	Western
	Norman	Clay-Norman
	Pennington	Pennington-Red Lake
	Pipestone	Western
	Polk	
	Pope	Western
	Red Lake	Pennington-Red Lake
	Redwood	Southern
	Renville	Northern
	Rock	Western
	Sibley	Northern
	Steele	Eastern
	Stevens	Western
	Swift	Western
	Traverse	Western
	Waseca	Eastern
	Watonwan	Southern
	Wilkin	Western
	Yellow Medicine	Western

COMPARING MINNESOTA'S FIFTH INVENTORY WITH THE FOURTH INVENTORY

The following paragraphs highlight some of the procedural changes since the last inventory to assist the reader in analyzing data from this report:

A new volume estimation procedure was developed for the Lake States (see Survey Procedures section), and this procedure was used to compute the 1989 volumes and also to recompute the 1977 volume for growth calculations. Although the adjustment will differ by Survey Unit and species, the recomputed 1977 growing-stock and board foot volumes will generally be greater than those shown in the 1977 report.

Past surveys used only growing-stock trees to determine stand-size class. Current survey procedures require that stand-size class be determined on the basis of all live trees. Therefore, direct comparisons of current inventory data to old inventory data by stand-size class may be misleading.

The basic building block for estimating forest area and timber volume has been changed from the Survey Unit to the county. In the past, the statistics were developed at the Unit level and prorated back to the county on the basis of photo-interpretation points. Direct development of county-level data helps users interested in more precise local data, but can make the outcome of comparisons with past estimates uncertain.

SURVEY PROCEDURES

The 1990 Minnesota survey used a growth model-enhanced, two-phase sample design. Using this sampling scheme and associated estimators is similar to sampling with partial replacement (SPR), in that a set of randomly located plots is available for remeasurement and a random set of new plots is established and measured. A significant feature of the new Minnesota design is stratification for disturbance on the old sample and use of a growth model to improve regression estimates made on old undisturbed forest plots (fig. 9). Detailed descriptions of the sampling and estimation

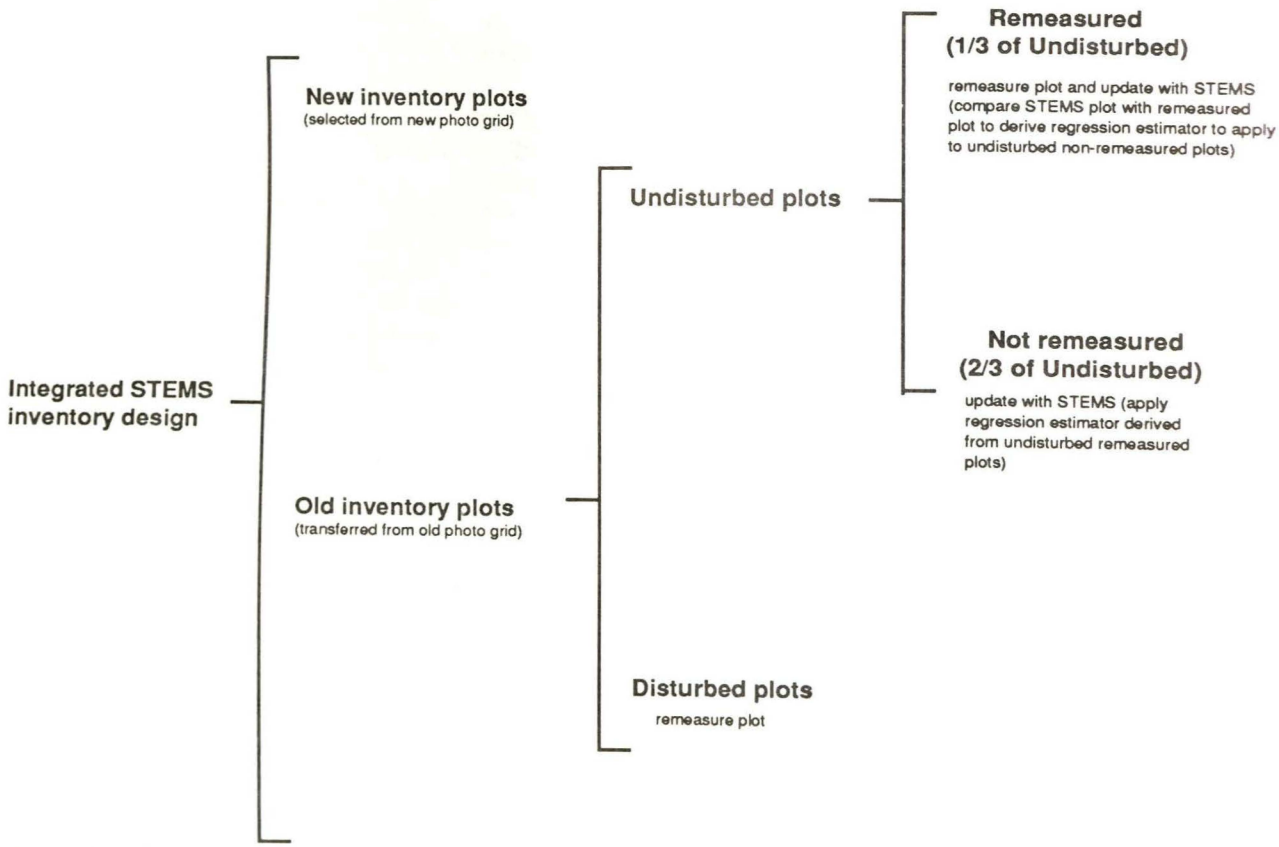
Integrated STEMS inventory design
New inventory plots
(selected from new photo grid)
Old inventory plots
(transferred from old photo grid)
Undisturbed plots
Remeasured
(1/3 of Undisturbed)
remeasure plot and update with STEMS (compare STEMS plot with remeasured plot to derive regression estimator to apply to undisturbed non-remeasured plots)
Not remeasured
(2/3 of Undisturbed)
update with STEMS (apply regression estimator derived from undisturbed remeasured plots)
Disturbed plots
remeasure plot

Figure 9.—Overview of the Minnesota sample design.

procedures are presented by Hansen (1990)[2]. The growth model used in the Minnesota survey design was the Lake States Stand and Tree Evaluation and Modeling System (STEMS)[3].

These were the major steps in the new survey design:

1. Aerial photography (Phase 1)

In this phase two sets of random points were located on current aerial photography. The first is a set of new photo plots and the second is a set of relocated old ground plot locations from the 1977 inventory. Photos used in the Aspen-Birch and Northern Pine Units were 1:58,000 scale color infrared National High Altitude Photo program (NHAP) prints purchased by the Minnesota Department of Natural Resources (DNR) from the U.S. Geological Survey. Aerial photos used in the Central Hardwood and Prairie Units were 1:40,000 scale black and white photos furnished by the Agricultural Stabilization and Conservation Service (ASCS). In addition, the DNR provided 35mm true color prints at a scale of 1:15,840 of all of the 1977 ground plot locations. These 35mm prints were used in addition to the NHAP prints to help detect disturbances in the 1977 ground plot locations. The dates of photography for each unit in the State are given in the next column. Dates of photography for individual counties can be found in their respective unit reports. Photo interpretation for the Aspen-Birch Unit and Northern Pine Unit was performed by the DNR. FIA photo interpreters classified the Central Hardwood and Prairie Units.

	Date	
Unit	NHAP or ASCS	35mm
Aspen-Birch	1981-1984	1986-1987
Northern Pine	1981-1985	1985-1989
Central Hardwoods	1976-1984	1988
Prairie	1978-1982	1988

The locations of the plots used in the 1977 inventory were transferred to these new photographs. The photographs were then assembled into township mosaics, and a systematic grid of 121 one-acre photo plots (each plot representing approximately 190.4 acres) was overlaid on each township mosaic. Each of these photo plots was examined by aerial photogrammetrists and classified stereoscopically based on land use. If trees were present, forest type and stand-size/density class were recorded. All of the 1977 ground plot locations were also examined for disturbance (logging, fire, catastrophic mortality, etc.) with the aid of the 35mm photographs. After this examination, all the old "disturbed" sample locations and one-third of the old "undisturbed" forested plots were sent to the field for survey crews to verify the photo classification and to take further measurements. All photo plot locations for the 1990 inventory were examined and were classified as shown in the following tabulation:

Photo land class	Photo plots
Timberland	73,506
Reserved forest land	5,906
Other forest land	5,918
Questionable	2,876
Nonforest with trees	4,503
Nonforest without trees	174,934
Water	16,777
All classes	284,420

2. Plot measurements (Phase 2)

On plots classified as timberland, wooded pasture, or windbreak (at least 120 feet wide), a ground plot was established, remeasured, or modeled. Old plots sent to the field for remeasurement that could not be relocated were replaced with a new plot at the approximate

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[2] *Hansen, Mark H. 1990. A comprehensive sampling system for forest inventory based on an individual tree growth model. St. Paul, MN: University of Minnesota, College of Natural Resources. 256 p. Ph.D. dissertation.*

[3] *Belcher, David W.; Holdaway, Margaret R.; Brand, Gary J. 1982. A description of STEMS the stand and tree evaluation and modeling system. Gen. Tech. Rep. NC-79. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 18 p.*

location of the old one. Each ground plot consists of a 10-point cluster covering approximately 1 acre. At each point, trees 5.0 inches or more in d.b.h. were sampled on a 37.5 Basal Area Factor (BAF) variable-radius plot, and trees less than 5.0 inches d.b.h. were sampled on a 1/300-acre fixed-radius plot. The measurement procedures for the new and old sample locations were as follows:

a. New inventory plots

A random sample of the new photo plots was selected for field measurement. Ground plots were established, and measures of current classification such as land use, forest type, and ownership as well as size and condition of all trees on the plot were recorded. These locations were monumented for future remeasurement.

b. Old inventory plots

These plots were established, monumented, and measured as part of the 1977 field inventory. The procedures for these old plots were different from those for the new plots. Old plots were classed as "undisturbed" or "disturbed" in the aerial photo phase of the sampling process. All disturbed plots and a one-third sample of the undisturbed forested plots were remeasured to obtain estimates of current condition and changes since the last inventory. All trees measured on these plots in 1977 were remeasured or otherwise accounted for, and all new trees were identified and measured.

All sample plots that were forested at the time of the 1977 inventory and determined to be undisturbed until this inventory were projected to the current time using STEMS. This procedure gives projected estimates of current volume and growth for these undisturbed plots. The comparison of the projected and observed values on the one-third sample of the undisturbed forest plots that were remeasured provided local calibration data to adjust the projected values of the undisturbed plots that were not remeasured. The adjustment procedure is a modified version of the method described by Smith[4].

In the Aspen-Birch and Northern Pine Units, plots that were classified in Phase 1 as undisturbed nonforest were visually inspected from fixed wing aircraft to verify this classification. If the spotter felt the photo interpreter had misclassified the plot, the plot was ground checked by a field crew.

The undisturbed forested plots that were not remeasured played a crucial role in the new survey design. These plots, after careful examination comparing past and current aerial photography, were determined to be undisturbed and had conditions that could be simulated by STEMS. The STEMS growth model was used to "grow" the old plot and tree data to produce an estimate of current data. Thus, these plots were treated as ground plots, even though they were never visited. The plot record for each modeled plot was sent to the field for verification of current ownership information.

All old plots classified as disturbed were sent to the field for remeasurement to assess and verify changes since the last inventory. Disturbance refers to any change on a plot that can be detected on aerial photos and that the STEMS growth processor cannot predict, such as catastrophic mortality, cutting, seedling stands, and land use change.

The estimation procedure for computing statistics from this sampling design was more complicated than the simple two-phase estimation procedure used in the past. In fact, this procedure yielded two independent samples, one coming from the new photo points and the other from the old photo points that are remeasured or modeled. The tabulation on the next page summarizes the distribution of all ground plots for the new inventory design by type of plot:

[4] *Smith, W. Brad. 1983. Adjusting the STEMS regional growth models to improve local predictions. Res. Note NC-297. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 5 p.*

Ground land use class	Old plots remeasured	Old plots updated	New plots	Total plots
Timberland	6,430	2,962	2,726	12,118
Reserved forest land	27	20	630	677
Other forest land	250	424	149	823
Nonforest with trees	462	92	127	681
Nonforest without trees	8,357	14,994	3,991	27,342
Water	583	1,050	685	2,318
Total	16,109	19,542	8,308	43,959

3. Area estimates

Area estimates were made using two-phase estimation methods. In this type of estimation, a preliminary estimate of area by land use is made from the aerial photographs (Phase 1) and corrected by the plot measurements (Phase 2). A complete description of this estimation method is presented by Loetsch and Haller (1964)[5].

4. Volume estimates

Estimates of volume per acre were made from the trees measured or modeled on the 10-point plots. Estimates of volume per acre were multiplied by the area estimates to obtain estimates of total volume. Net cubic foot volumes are based on a modification of the method presented by Hahn (1984)[6] for use in the Lake States. For the Minnesota inventory, the merchantable height equation presented was used in conjunction with Stone's equation to estimate gross volume. This estimate was then corrected by species for variation in bark and cull volume to yield an estimate of net volume.

The Forest Service reports all board foot volume in International 1/4-inch rule. In Minnesota, the Scribner log rule is commonly used. Scribner log rule conversion factors were derived from full tree measurements taken throughout the Lake States (Michigan, Wisconsin, and Minnesota) and an equation developed by Wiant and Castenaeda (1977)[7]. The factors (multipliers) used here to convert board foot International volumes to the Scribner rule are shown in the following tabulation:

D.b.h. (inches)	Scribner rule conversion factor	
	Softwoods	Hardwoods
9.0-10.9	0.7830	—
11.0-12.9	.8287	0.8317
13.0-14.9	.8577	.8611
15.0-16.9	.8784	.8827
17.0-18.9	.8945	.8999
19.0-20.9	.9079	.9132
21.0-22.9	.9168	.9239
23.0-24.9	.9240	.9325
25.0-26.9	.9299	.9396
27.0-28.9	.9321	.9454
29.0+	.9357	.9544

5. Growth and mortality estimates

On remeasured plots, estimates of growth and mortality per acre come from the remeasured diameters of trees and from observation of trees that died between inventories. Growth reported as the average net annual growth between the two inventories (1977 and 1990) is computed from data on remeasurement plots and modeled

[5] *Loetsch, F.; Haller, K.E. 1964. Forest inventory, volume 1, statistics of forest inventory and information from aerial photographs. BLV Verlagsgesellschaft Munch Basle Vienna. 436 p.*

[6] *Hahn, Jerold T. 1984. Tree volume and biomass equations for the Lake States. Res. Pap. NC-250. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 10 p.*

[7] *Wiant, Harry V., Jr.; Castenaeda, Froylan. 1977. Mesavage and Girard's volume tables formulated. BLM4. Denver, CO: U.S. Department of Interior, Bureau of Land Management, Denver Service Center: 1-4.*

plots using methods presented by VanDeusen *et al.* (1986)[8]. Mortality is also average net annual for the remeasurement period. On new plots, where trees were not remeasured, estimates of growth and mortality were obtained by using STEMS to project the growth and mortality of trees for 1 year. Growth and mortality estimates for old undisturbed plots that were updated were derived in the same manner as remeasured plots. The STEMS growth model was adjusted by Survey Unit to meet local conditions, using data from the undisturbed remeasurement plots. As with volume, total growth and mortality estimates were obtained by multiplying the per acre estimates by area estimates. Current annual growth for 1989 was computed by using the adjusted STEMS model to grow all current inventory plots for 1 year.

6. Average annual removals estimates

Average annual growing-stock and sawtimber removals (1977 to 1989) were estimated only from the remeasured plots; new plots were not used to estimate removals. These estimates are obtained from trees measured in the last survey and cut or otherwise removed from the timberland base. Because remeasurement plots make up about one-half of the total ground plots, average annual removals estimates have greater sampling errors than volume and growth estimates.

Tree Grade

All sawtimber sample trees were graded for quality and assigned a tree grade on approximately one-third of the sample plots in Minnesota. Tree grades are based on the classification of external characteristics as indicators of quality. The volume yield by tree grade for this sample was used to distribute the volume of the ungraded sample trees by species group.

Hardwood sawtimber trees were graded according to "Hardwood tree grades for factory lumber."[9] The best 12-foot section of the lowest 16-foot hardwood log was used for grading. Hardwood sawtimber trees that did not meet minimum tree grade specifications for grades 1 through 3 were assigned grade 4 according to Forest Service standard specifications for hardwood construction logs described in "A guide to hardwood log grading."[10]

Red pine and jack pine sawtimber trees were graded based on specifications described in "Forest Service log grades for southern pines."[11] White pine and other softwood sawtimber trees were graded according to specifications described in the circular "Log Grades"[12] from the University of Wisconsin. For all softwoods, the first merchantable 16-foot log, or shorter lengths down to 12 feet, was used for grading.

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[8] *VanDeusen, P.C.; Dell, T.R.; Thomas, C.E. 1986. Volume growth estimation from permanent horizontal points. Forest Science. 32: 415-422.*

[9] *Hanks, Leland F. 1976. Hardwood tree grades for factory lumber. Res. Pap. NE-333. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 81 p.*

[10] *Rast, Everette D.; Sonderman, David L.; Gammon, Glenn L. 1973. A guide to hardwood log grading. Gen. Tech. Rep. NE-1. Upper Darby, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 31 p.*

[11] *Campbell, Robert A. 1964. Forest Service log grades for southern pine. Res. Pap. SE-11. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station. 17 p.*

[12] *Peterson, Ted. 1965. Log grades. Spec. Circ. 60. Madison, WI: University of Wisconsin, Extension Service, College of Agriculture. 4 p.*

Hardwood Tree Grades for Factory Lumber

Grade factor	Tree grade 1	Tree grade 2	Tree grade 3
Length of grading zone (feet)	Butt 16	Butt 16	Butt 16
Length of grading section [a] (feet)	Best 12	Best 12	Best 12
DBH, minimum (inches)	16[b]	13	11
Diameter, minimum inside bark at top of grading section (inches)	13[b] 16 20	11[c] 12	8
Clear cuttings (on the three best faces)[d]			
Length, minimum (feet)	7 5 3	3 3	2
Number on face (maximum)	2	2 3	e
Yield in face length (minimum)	5/6	4/6	3/6
Cull deduction (including crook and sweep, but excluding shake) maximum within grading section (percent)	9	9[f]	50

[a] *Whenever a 14- or 16-foot section of the butt 16-foot log is better than the best 12-foot section, the grade of the longer section will become the grade of the tree. This longer section, when used, is the basis for determining the grading factors such as diameter and cull deduction.*

[b] *In basswood and ash, DIB at top of grading section must be 12 inches and DBH must be 15 inches.*

[c] *Grade 2 trees can be 10 inches DIB at top of grading section if otherwise meeting surface requirements for small grade 1's.*

[d] *A clear cutting is a portion of a face free of defects, extending the width of the face. A face is one-fourth of the surface of the grading section as divided lengthwise.*

[e] *Unlimited.*

[f] *Fifteen percent crook and sweep or 40 percent total cull deduction are permitted in grade 2, if size and surface of grading section qualify as grade 1. If rot shortens the required clear cuttings to the extent of dropping the butt log to grade 2, do not drop the tree's grade to 3 unless the cull deduction for rot is greater than 40 percent.*

Forest Service Standard Specifications for Hardwood Construction Logs (tie and timber logs)[1]

Position in tree	Butts and uppers
Min. diameter, small end	8 inches +
Min. length without trim	8 feet
Clear cuttings	No requirements
Sweep allowance	One-fourth of the diameter at the small end for each 8 feet of length.
Sound surface defects:	
Single knots	Any number, if no one knot has an average diameter above the callus in excess of one-third of the log diameter at point of occurrence.
Whorled knots	Any number, if the sum of knot diameters above the callus does not exceed one-third of the log diameter at point of occurrence.
Holes	Any number, provided none has a diameter over one-third of the log diameter at point of occurrence and none extends more than 3 inches into included timber[2].
Unsound surface defects :	Same requirements as for sound defects if they extend into included timber. No limit if they do not.

[1]*These specifications are minimum for the class. If, from a group of logs, factory logs are selected first, thus leaving only nonfactory logs from which to select construction logs, then the quality range of the construction logs so selected is limited, and the class may be considered a grade. If selection for construction logs is given first priority, it may be necessary to subdivide the class into grades.*

[2]*Included timber is always square, and dimension is judged from small end.*

Tree Grades for Eastern White Pine

Log grade	Minimum size [1] Diameter (Inches)	Length (Feet)	Sweep or crook allowance (Percent)	Total cull allowance including sweep (Percent)	Maximum weevil injury (Number)	Allowable knot size (inches)[2] on three best faces or minimum clearness on four faces (Inches)
1	12 & 13	8-16	20	50	0	Four faces clear full length
	14+	10-16	20	50	0	Two faces clear full length, or four faces clear 50 percent length (6 feet min. length)[3]
2	6+	8-16	30	50	0	Sound knots l.e[4] D/6 and less than 3 inches[5] Unsound knots: l.e.1-1/2 inches and for: butt, logs l.e. D/12 upper logs l.e. D/10, or four faces clear 50 percent of length
3	6+	8-16	40	50	8-foot logs: 1 weevil 10-foot+ logs: 2 weevils	Sound knots l.e. D/3 and less than 5 inches Unsound knots l.e. D/6 and less than 2-1/2 inches
4	6+	8-16	50	50	No limit	No limit

[1] *Plus trim.*

[2] *Disregard all knots less than one-half-inch diameter in all grades.*

[3] *The sum of the diameter of sound knots plus twice the sum of the diameter of unsound knots (in inches) is less than or equal to half of the diameter of the log (inches).*

[4] *l.e. means less than or equal to.*

[5] *D means DIB of log at location of knot.*

Tree Grades for Jack Pine and Red Pine

Grade 1: Trees with three or four clear faces on the 16-foot grading section.[1]
Grade 2: Trees with one or two clear faces on the 16-foot grading section.
Grade 3: Trees with no clear faces on the 16-foot grading section.

After the tentative grade is established from above, the tree will be reduced one grade for each of the following, except that no tree can be reduced below grade 3, provided the total scaling deductions for sweep and/or rot do not exceed two-thirds of the gross scale of the tree.

1. *Sweep.* Degrade any tentative grade 1 or 2 tree one grade if sweep in the lower 12 feet of grading sections amounts to 3 or more inches and equals or exceeds one-fourth of the diameter at breast height.

2. *Heart rot.* Degrade any tentative grade 1 or 2 tree one grade if conk, punk knots, massed hyphae, or other evidence of advanced heart rot is found anywhere on the main tree stem.

[1] *A face is one-fourth of the circumference in width extending the full length of the grading section. Clear faces are those free of: knots measuring more than one-half-inch in diameter, overgrown knots of any size, and holes more than one-fourth-inch in diameter. Faces may be rotated to obtain the maximum number of clear ones on the grading section.*

Tree Grades for All Other Softwood Logs

Grade 1

1. Trees must be 16 inches in diameter or larger, grading section 12 feet in length or longer, and with deduction for defect not over 30 percent of gross scale.

2. Trees must be at least 75 percent clear on each of three faces.

3. All knots outside clear cutting must be sound and not more than 2-1/2 inches in size.

Grade 2

1. Trees must be 12 inches in diameter or larger, grading section 12 feet in length or longer, and with a net scale after deduction for defect of at least 50 percent of the gross scale deducted for defect.

2. Trees must be at least 50 percent clear on each of three faces or 75 percent clear on two faces.

Grade 3

1. Trees must be 6 inches in diameter or larger, grading section 12 feet in length or longer, and with a net scale after deduction for defect of at least 50 percent of the gross contents of the log.

Note: A) Diameters are diameter inside bark (DIB) at small end of grading section.
B) Percent clear refers to percent clear in one continuous section.

METRIC EQUIVALENTS OF UNITS USED IN THIS REPORT

1 acre = 4,046.86 square meters or 0.405 hectare.
1,000 acres = 405 hectares.
1 cubic foot = 0.0283 cubic meter.
1 foot = 30.48 centimeters or 0.3048 meter.
1 inch = 25.4 millimeters, 2.54 centimeters, or 0.0254 meter.
1 pound = 0.454 kilograms.
1 ton = 0.907 metric tons.

TREE SPECIES GROUPS IN MINNESOTA[13]

SOFTWOODS

Eastern white pine ..... *Pinus strobus*
Red pine ..... *Pinus resinosa*
Jack pine ..... *Pinus banksiana*
White spruce ..... *Picea glauca*
Black spruce ..... *Picea mariana*
Balsam fir ..... *Abies balsamea*
Tamarack ..... *Larix laricina*
Northern white-cedar ..... *Thuja occidentalis*
Other softwoods:
  Eastern redcedar ..... *Juniperus virginiana*
  Scotch pine ..... *Pinus sylvestris*
  Ponderosa pine ..... *Pinus ponderosa*

HARDWOODS

White oak[14]
  White oak ..... *Quercus alba*
  Bur oak ..... *Quercus macrocarpa*
  Swamp white oak ..... *Quercus bicolor*
Red oak[14]
  Northern red oak ..... *Quercus rubra*
  Northern pin oak ..... *Quercus ellipsoidalis*
  Black oak ..... *Quercus velutina*
Hickory[14]
  Shagbark hickory ..... *Carya ovata*
  Bitternut hickory ..... *Carya cordiformis*
Yellow birch[15] ..... *Betula alleghaniensis*
Hard maple[14]
  Black maple ..... *Acer nigrum*
  Sugar maple ..... *Acer saccharum*
Soft maple[15]
  Red maple ..... *Acer rubrum*
  Silver maple ..... *Acer saccharinum*
Ash[14]
  Black ash ..... *Fraxinus nigra*
  Green ash ..... *Fraxinus pennsylvanica*
  White ash ..... *Fraxinus americana*
Balsam poplar [15] ..... *Populus balsamifera*
Aspen[15]
  Bigtooth aspen ..... *Populus grandidentata*
  Quaking aspen ..... *Populus tremuloides*
Cottonwood[15] ..... *Populus deltoides*
Basswood[15] ..... *Tilia americana*
Black walnut[14] ..... *Juglans nigra*
Black cherry[15] ..... *Prunus serotina*
Butternut[15] ..... *Juglans cinerea*
Elm
  American elm[15] ..... *Ulmus americana*
  Siberian elm[15] ..... *Ulmus pumila*
  Slippery elm[15] ..... *Ulmus rubra*
  Rock elm[14] ..... *Ulmus thomasii*
Paper birch[15] ..... *Betula papyrifera*
River birch[15] ..... *Betula nigra*
Hackberry[15] ..... *Celtis occidentalis*
Black willow[15] ..... *Salix nigra*
Other hardwoods
  Boxelder[15] ..... *Acer negundo*
  Kentucky coffeetree[14] ..... *Gymnocladus dioicus*
  Black locust[14] ..... *Robinia pseudoacacia*
  Red mulberry[15] ..... *Morus rubra*
  Honeylocust[14] ..... *Gleditsia triacanthos*
  Northern catalpa[14] ..... *Catalpa speciosa*
Noncommercial species
  Striped maple ..... *Acer pensylvanicum*
  Mountain maple ..... *Acer spicatum*
  Ailanthus ..... *Ailanthus altissima*
  American hornbeam ..... *Carpinus caroliniana*
  Hawthorn ..... *Crataegus* spp.
  Apple ..... *Malus* spp.
  Eastern hophornbeam ..... *Ostrya virginiana*
  Pincherry ..... *Prunus pensylvanica*
  Wild plum ..... *Prunus* spp.
  Chokecherry ..... *Prunus virginiana*
  Peachleaf willow ..... *Salix amygdaloides*
  Mountain ash ..... *Sorbus americana*

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[13] *The common and scientific names are based on: Little, Elbert L. 1981. Checklist of native and naturalized trees of the United States. Agric. Handb. 541. Washington, DC: U.S. Department of Agriculture, Forest Service. 385 p.*

[14] *This species or species group is considered a hard hardwood, with an average specific gravity greater than or equal to 0.50.*

[15] *This species or species group is considered a soft hardwood, with an average specific gravity of less than 0.50.*

DEFINITION OF TERMS

Average annual removals from growing stock.—The average net growing-stock volume in growing-stock trees removed annually for forest products (including roundwood products and logging residues) and for other uses (see Other removals). Average annual removals of growing stock are reported for a period of several years (1977 to 1989 in this report) and are based on information obtained from remeasurement plots (see Survey Procedures in Appendix).

Average annual removals from sawtimber.—The average net board foot sawtimber volume of live sawtimber trees removed annually for forest products (including roundwood products and other uses [see Other removals]). Average annual removals of sawtimber are reported for a period of several years (1977 to 1989 in this report) and are based on information obtained from remeasurement plots (see Survey Procedures in Appendix).

Basal area.—Tree area in square feet of the cross section at breast height of a single tree. When the basal areas of all trees in a stand are summed, the result is usually expressed as square feet of basal area per acre.

Biomass.—The above-ground volume of all live trees (including bark but excluding foilage) reported in green tons. Biomass has four components:

Bole.—Biomass of a tree from 1 foot above the ground to a 4-inch top outside bark.

Tops and limbs.—Total biomass of tree from a 1-foot stump minus the bole.

1- to 5-inch trees.—Total above-ground biomass of a tree from 1 to 5 inches in diameter at breast height.

Stump.—Biomass of a tree 5-inches d.b.h. and larger from the ground to a height of 1 foot.

Commercial species.—Tree species presently or prospectively suitable for industrial wood products. (Note: Excludes species of typically small size, poor form, or inferior quality such as hophornbeam, osage-orange, and redbud.)

Cord.—One standard cord is 128 cubic feet of stacked wood, including bark and air space. Cubic feet can be converted to standard cords by dividing by 79.

County and municipal land.—Land owned by counties and local public agencies or municipalities, or land leased to these governmental units for 50 years or more.

Cull.—Portions of a tree that are unusable for industrial wood products because of rot, missing or dead material, or other defect.

Current annual growth of growing stock.—The annual change in volume of sound wood in live sawtimber and poletimber trees and the total volume of trees entering these classes through ingrowth, less volume losses resulting from natural causes. Current growth is based on an estimate of the current annual increment of each growing stock tree in the inventory.

Current annual growth of sawtimber.—The annual change in the volume of live sawtimber trees and the total volume of trees reaching sawtimber size, less volume losses resulting from natural causes. Current growth is based on an estimate of the current annual increment of each growing-stock tree in the inventory.

Current annual removals from growing stock.—The current net growing-stock volume in growing-stock trees removed annually for forest products (including roundwood products and logging residues) and for other uses (see Other removals). Current annual removals of growing stock are reported for a single year (1988 in this report) and are based on a survey of primary wood processing mills to determine removals for products and on information from remeasurement plots (see Survey Procedures in Appendix) to determine removals due to land use change.

Current annual removals from sawtimber.—The current net board foot sawtimber volume of live sawtimber trees removed annually for forest products (including roundwood products and other uses [see Other removals]).

Current annual removals of sawtimber are reported for a single year (1988 in this report) and are based on a survey of primary wood processing mills to determine removals for products and on information from remeasurement plots (see Survey Procedures in Appendix) to determine removals due to land use change.

Diameter class.—A classification of trees based on diameter outside bark, measured at breast height (d.b.h.). Two-inch diameter classes are commonly used in Forest Inventory and Analysis, with the even inch the approximate midpoint for a class. For example, the 6-inch class includes trees 5.0 through 6.9 inches d.b.h.

Diameter at breast height (d.b.h.).—The outside bark diameter at 4.5 feet (1.37 m) above the forest floor on the uphill side of the tree. For determining breast height, the forest floor includes the duff layer that may be present, but does not include unincorporated woody debris that may rise above the ground line.

Farm.—Any place from which $1,000 or more of agricultural products were produced and sold during the year.

Farmer-owned land.—Land owned by farm operators whether part of the farmstead or not. (Note: Excludes land leased by farm operators from nonfarm owners, such as railroad companies and States.)

Forest land.—Land at least 16.7 percent stocked by forest trees of any size, or formerly having had such tree cover, and not currently developed for nonforest use. (Note: Stocking is measured by comparing specified standards with basal area and/or number of trees, age or size, and spacing.) The minimum area for classification of forest land is 1 acre. Roadside, streamside, and shelterbelt strips of timber must have a crown width of at least 120 feet to qualify as forest land. Unimproved roads and trails, streams, or other bodies of water or clearings in forest areas shall be classed as forest if less than 120 feet wide. (See Tree, Land, Timberland, Reserved forest land, Other forest land, Stocking, and Water.)

Forest industry land.—Land owned by companies or individuals that operate a primary wood-using plant.

Forest type.—A classification of forest land based on the species forming a plurality of live tree stocking. Major forest types in the State are:

Jack pine.—Forests in which jack pine comprises a plurality of the stocking. (Common associates include eastern white pine, red pine, aspen, birch, and maple.)

Red pine.—Forests in which red pine comprises a plurality of the stocking. (Common associates include eastern white pine, jack pine, aspen, birch, and maple.)

White pine.—Forests in which eastern white pine comprises a plurality of the stocking. (Common associates include red pine, jack pine, aspen, birch, and maple.)

Balsam fir.—Forests in which balsam fir and white spruce comprise a plurality of stocking with balsam fir the most common. (Common associates include aspen, maple, birch, northern white-cedar, and tamarack.)

White spruce.—Forests in which white spruce and balsam fir comprise a plurality of the stocking with white spruce the most common. (Common associates include aspen, maple, birch, northern white-cedar, and tamarack.)

Black spruce.—Forests in which swamp conifers comprise a plurality of the stocking with black spruce the most common. (Common associates include tamarack and northern white-cedar.)

Northern white-cedar.—Forests in which swamp conifers comprise a plurality of the stocking with northern white-cedar the most common. (Common associates include tamarack and black spruce.)

Tamarack.—Forests in which swamp conifers comprise a plurality of the stocking with tamarack the most common. (Common associates include black spruce and northern white-cedar.)

Oak-hickory.—Forests in which northern red oak, white oak, bur oak, or hickories, singly or in combination, comprise a plurality of the stocking. (Common associates include jack pine, elm, and maple.)

Elm-ash-soft maple.—Forests in which lowland elm, ash, red maple, silver maple, and cottonwood, singly or in combination, comprise a plurality of the stocking. (Common associates include birches, spruce, and balsam fir.)

Maple-basswood.—Forests in which sugar maple, basswood, yellow birch, upland American elm, and red maple, singly or in combination, comprise a plurality of the stocking. (Common associates include white pine, elm, and basswood.)

Aspen.—Forests in which quaking aspen or bigtooth aspen, singly or in combination, comprise a plurality of the stocking. (Common associates include balsam poplar, balsam fir, and paper birch.)

Paper birch.—Forests in which paper birch comprises a plurality of the stocking. (Common associates include maple, aspen, and balsam fir.)

Balsam poplar.—Forests in which balsam poplar comprises a plurality of the stocking. (Common associates include aspen, elm, and ash.)

Growing-stock tree.—A live tree of commercial species that meets specified standards of size, quality, and merchantability. (Note: Excludes rough, rotten, and dead trees.)

Growing-stock volume.—Net volume in cubic feet of growing-stock trees 5.0 inches d.b.h. and over, from 1 foot above the ground to a minimum 4.0 inch top diameter outside bark of the central stem or to the point where the central stem breaks into limbs.

Hard hardwoods.—Hardwood species with an average specific gravity greater than 0.50 such as oaks, hard maple, hickories, and ash.

Hardwoods.—Dicotyledonous trees, usually broad-leaved and deciduous. (See Soft hardwoods and Hard hardwoods.)

Indian land.—Land held in trust by the United States for the tribes or individual Indians.

Land.—A. *Bureau of the Census.* Dry land and land temporarily or partly covered by water such as marshes, swamps, and river flood plains (omitting tidal flats below mean high tide); streams, sloughs, estuaries, and canals less than one-eighth of a statute mile wide; and lakes, reservoirs, and ponds less than 40 acres in area.

B. *Forest Inventory and Analysis.* The same as the Bureau of the Census, except minimum width of streams, etc., is 120 feet and minimum size of lakes, etc., is 1 acre.

Log grade.—A log classification based on external characteristics as indicators of quality or value. (See Appendix for specific grading factors used.)

Marsh.—Nonforest land that characteristically supports low, generally herbaceous or shrubby vegetation and that is intermittently covered with water.

Merchantable.—Refers to a pulpwood or saw log section that meets pulpwood or saw log specifications, respectively.

Miscellaneous Federal land.—Federal land other than National Forest and land administered by the Bureau of Land Management or Bureau of Indian Affairs.

Miscellaneous private land.—Privately owned land other than forest-industry and farmer-owned land.

Mortality.—The volume of sound wood in growing-stock and sawtimber trees that die annually.

National Forest land.—Federal land that has been legally designated as National Forest or purchase units, and other land administered by the USDA Forest Service.

Net annual growth of growing stock.—The annual change in volume of sound wood in live sawtimber and poletimber trees and the total volume of trees entering these classes through ingrowth, less volume losses resulting from natural causes.

Net annual growth of sawtimber.—The annual change in the volume of live sawtimber trees and the total volume of trees reaching sawtimber size, less volume losses resulting from natural causes.

Net volume.—Gross volume less deductions for rot, sweep, or other defect affecting use for timber products.

Noncommercial species.—Tree species of typically small size, poor form, or inferior quality that normally do not develop into trees suitable for industrial wood products.

Nonforest land.—Land that has never supported forests, and land formerly forested where use for timber management is precluded by development for other uses. (Note: Includes areas used for crops, improved pasture, residential areas, city parks, improved roads of any width and adjoining clearings, powerline clearings of any width, and 1- to 40-acre areas of water classified by the Bureau of the Census as land. If intermingled in forest areas, unimproved roads and nonforest strips must be more than 120 feet wide and more than 1 acre in area to qualify as nonforest land.)

a. *Nonforest land without trees.*—Nonforest land with no live trees present.

b. *Nonforest land with trees.*—Nonforest land with one or more trees per acre at least 5 inches d.b.h.

Nonstocked land.—Forest land less than 16.7 percent stocked with all live trees.

Other forest land.—Forest land not capable of producing 20 cubic feet per acre per year of industrial wood crops under natural conditions and not associated with urban or rural development. These sites often contain tree species that are not currently utilized for industrial wood production or trees of poor form, small size, or inferior quality that are unfit for industrial products. Unproductivity may be the result of adverse site conditions such as sterile soil, dry climate, poor drainage, high elevation, and rockiness. This land is not withdrawn from timber utilization.

Other removals.—Growing-stock trees removed but not utilized for products, or trees left standing but "removed" from the timberland classification by land use change. Examples are removals from cultural operations such as timber stand improvement work, land clearing, and changes in land use.

Ownership size class.—The amount of timberland owned by one owner, regardless of the number of parcels.

Ownership tenure.—The length of time a property has been held by the owner.

Physiographic class.—A measure of soil and water conditions that affect tree growth on a site. The physiographic classes are:

Xeric sites.—Very dry soils where excessive drainage seriously limits both growth and species occurrence.

Xeromesic sites.—Moderately dry soils where excessive drainage limits growth and species occurrence to some extent. Example: dry oak ridge.

Mesic sites.--Deep, well-drained soils. Growth and species occurrence are limited only by climate.

Hydromesic sites.—Moderately wet soils where insufficient drainage or infrequent flooding limits growth and species occurrence to some extent. Example: better drained bottomland hardwood sites.

Hydric sites.—Very wet sites where excess water seriously limits both growth and species occurrence. Example: frequently flooded river bottoms and cypress swamps.

Poletimber stand.—(See Stand-size class.)

Poletimber tree.—A tree of commercial species at least 5.0 inches d.b.h. but smaller than sawtimber size.

Potential productivity class.—A classification of forest lands in terms of inherent capacity to grow crops of industrial wood. The class identifies the potential growth in merchantable cubic feet/acre/year at culmination of mean annual increment of fully stocked natural stands.

Reserved forest land.—Forest land withdrawn from timber utilization through statute, administrative regulation, designation, or exclusive use for Christmas tree production, as indicated by annual shearing.

Rotten tree.—A tree that does not meet regional merchantability standards because of excessive unsound cull. May include noncommercial tree species.

Rough tree.—A tree that does not meet regional merchantability standards because of excessive sound cull. May include noncommercial tree species.

Roundwood products.—Logs, bolts, or other round sections (including chips from roundwood) cut from trees for industrial or consumer uses. (Note: includes saw logs, veneer logs and bolts; cooperage logs and bolts; pulpwood; fuelwood; pilings; poles; posts; hewn ties; mine timbers; and various other round, split, or hewn products.)

Salvable dead tree.—A standing or down dead tree considered merchantable by regional standards.

Sapling.—A live tree 1.0 to 5.0 inches d.b.h.

Sapling-seedling stand.—(See Stand-size class.)

Saw log.—A log meeting minimum standards of diameter, length, and defect, including logs at least 8 feet long, sound and straight and with a minimum diameter outside bark (d.o.b.) for softwoods of 7.0 inches (9.0 inches for hardwoods) or other combinations of size and defect specified by regional standards.

Saw-log portion.—That part of the bole of sawtimber trees between the stump and the saw-log top.

Saw-log top.—The point on the bole of sawtimber trees above which a saw log cannot be produced. The minimum saw-log top is 7.0 inches d.o.b. for softwoods and 9.0 inches d.o.b. for hardwoods.

Sawtimber stand.—(See Stand-size class.)

Sawtimber tree.—A tree of commercial species containing at least a 12-foot saw log or two noncontiguous saw logs 8 feet or longer, and meeting regional specifications for freedom from defect. Softwoods must be at least 9.0 inches d.b.h. Hardwoods must be at least 11.0 inches d.b.h.

Sawtimber volume.—Net volume of the saw-log portion of live sawtimber in board feet, International 1/4-inch rule (unless specified otherwise) from stump to a minimum 7.0 inches top diameter outside bark (d.o.b.) for softwoods and a minimum 9.0 inches top d.o.b. for hardwoods.

Seedling.—A live tree less than 1.0 inch d.b.h. that is expected to survive. Only softwood seedlings more than 6 inches tall and hardwood seedlings more than 1 foot tall are counted.

Short-log (rough tree).—Sawtimber-size trees of commercial species that contain at least one merchantable 8- to 11-foot saw log but not a 12-foot saw log.

Site index.—An expression of forest site quality based on the height of a free-growing dominant or codominant tree of a representative species in the forest type at age 50.

Soft hardwoods.—Hardwood species with an average specific gravity less than 0.50 such as gum, yellow-poplar, cottonwood, red maple, basswood, and willow.

Softwoods.—Coniferous trees, usually evergreen, having needles or scale-like leaves.

Stand.—A group of trees on a minimum of 1 acre of forest land that is stocked by forest trees of any size.

Stand-age class.—Age of main stand. Main stand refers to trees of the dominant forest type and stand-size class.

Stand-size class.—A classification of stocked (see Stocking) forest land based on the size class of live trees on the area; that is, sawtimber, poletimber, or seedlings and saplings.

a. *Sawtimber stands*.—Stands with half or more of live stocking in sawtimber or poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.

b. *Poletimber stands*.—Stands with half or more live stocking in poletimber and/or sawtimber trees, and with poletimber stocking exceeding that of sawtimber.

c. *Sapling-seedling stands*.—Stands with more than half of the live stocking in saplings and/or seedlings.

State land.—Land owned by States or leased to them for 50 years or more.

Stocking.—The degree of occupancy of land by live trees, measured by basal area and/or the number of trees in a stand by size or age and spacing, compared to the basal area and/or number of trees required to fully utilize the growth potential of the land; that is, the stocking standard.

A stocking percent of 100 indicates full utilization of the site and is equivalent to 80 square feet of basal area per acre in trees 5.0 inches d.b.h. and larger. In a stand of trees less than 5 inches d.b.h., a stocking percent of 100 would indicate that the present number of trees is sufficient to produce 80 square feet of basal area per acre when the trees reach 5 inches d.b.h.

Stands are grouped into the following stocking classes:

Overstocked stands.—Stands in which stocking of live trees is 133 percent or more.

Fully stocked stands.—Stands in which stocking of live trees is from 100.0 to 132.9 percent.

Medium stocked stands.—Stands in which stocking of live trees is from 60.0 to 99.9 percent.

Poorly stocked stands.—Stands in which stocking of live trees is from 16.7 to 59.9 percent.

Nonstocked areas.—Timberland on which stocking of live trees is less than 16.7 percent.

Timberland.—Forest land that is producing or capable of producing in excess of 20 cubic feet per acre per year of industrial wood crops under natural conditions, that is not withdrawn from timber utilization, and that is not associated with urban or rural development. Currently inaccessible and inoperable areas are included.

Tree.—A woody plant usually having one or more perennial stems, a more or less definitely formed crown of foliage, and a height of at least 12 feet at maturity.

Tree biomass.—The total above-ground weight (including the bark but excluding the foilage) of all trees from 1 to 5 inches in d.b.h., and the total above-ground weight (including the bark but excluding the foilage) from a 1-foot stump for trees more than 5 inches in diameter.

Tree size class.—A classification of trees based on diameter at breast height, including sawtimber trees, poletimber trees, saplings, and seedlings.

Upper stem portion.—That part of the bole of sawtimber trees above the saw-log top to a minimum top diameter of 4.0 inches outside bark or to the point where the central stem breaks into limbs.

Water.—(a) *Bureau of the Census*.—Permanent inland water surfaces, such as lakes, reservoirs, and ponds at least 40 acres in area; and streams, sloughs, estuaries, and canals at least one-eighth of a statute mile wide.

(b) *Noncensus*.—Permanent inland water surfaces, such as lakes, reservoirs, and ponds from 1 to 39.9 acres in area; and streams, sloughs, estuaries, and canals from 120 feet to one-eighth of a statute mile wide.

Wooded strip.—An acre or more of natural continuous forest land that would otherwise meet survey standards for timberland except that it is less than 120 feet wide.

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(In thousand acres)

Unit and county	Land area	Forest land					Nonforest land	Nonforest land with trees, as a percent of land area
		All forest land	Timber-land	Timberland as a percent of land area	Other forest land	Reserved forest land	with trees	
Aspen-Birch Unit								
Carlton	550.6	352.6	340.5	61.6	5.2	6.9	24.1	4.4
Cook	928.5	854.9	565.4	62.6	2.9	286.6	1.8	0.2
Koochiching	1,985.5	1,732.8	1,423.9	71.6	287.7	21.2	12.2	0.6
Lake	1,343.6	1,199.1	850.1	64.7	19.2	329.8	10.4	0.8
St. Louis	3,984.4	3,223.7	2,698.8	68.8	165.0	359.9	57.2	1.5
Total	8,792.6	7,363.1	5,878.7	67.7	480.0	1,004.4	105.7	1.2
Northern Pine Unit								
Aitkin	1,164.4	760.2	710.9	60.6	48.3	1.0	31.7	2.7
Becker	838.7	335.3	332.3	39.6	--	3.0	16.0	1.9
Beltrami	1,603.4	929.7	841.8	52.5	85.0	2.9	76.0	4.7
Cass	1,291.3	868.6	841.6	64.7	25.4	1.6	30.1	2.3
Clearwater	636.7	321.7	289.4	45.2	13.6	18.7	13.1	2.0
Crow Wing	637.9	388.9	386.7	60.0	2.2	--	35.5	5.5
Hubbard	590.4	407.9	399.8	66.8	2.2	5.9	17.2	2.9
Itasca	1,705.8	1,362.4	1,324.4	77.8	37.2	0.8	58.6	3.4
Lake of the Woods	829.9	500.3	398.4	48.0	101.9	--	7.3	0.9
Mahnomen	355.9	116.6	113.9	31.8	1.1	1.6	1.1	0.3
Roseau	1,064.1	225.7	217.2	20.2	8.5	--	13.9	1.3
Wadena	342.7	119.1	119.1	34.6	--	--	3.0	0.9
Total	11,061.2	6,336.4	5,975.5	53.8	325.4	35.5	303.5	2.7
Central Hardwood Unit								
Anoka	271.4	38.9	34.2	12.4	1.6	3.1	39.0	14.2
Benton	261.3	34.7	34.7	13.3	--	--	10.1	3.9
Carver	228.6	19.2	19.2	8.5	--	--	0.6	0.3
Chisago	267.3	48.6	48.6	18.2	--	--	17.0	6.4
Dakota	364.6	13.5	12.4	3.4	--	1.1	2.5	0.7
Douglas	406.0	32.0	31.6	7.7	--	0.4	9.2	2.2
Fillmore	551.2	101.6	98.6	17.9	--	3.0	6.6	1.2
Goodhue	485.5	69.4	69.4	14.2	--	--	5.0	1.0
Hennepin	356.2	15.0	11.5	3.3	--	3.5	12.5	3.6
Houston	357.4	135.7	133.9	37.1	1.8	--	11.3	3.1
Isanti	281.0	54.1	54.1	19.2	--	--	9.2	3.3
Kanabec	336.0	142.2	142.2	42.1	--	--	11.0	3.3
Le Sueur	287.1	23.5	23.5	8.2	--	--	10.0	3.5
Mille Lacs	367.7	145.2	138.4	37.4	0.9	5.9	12.8	3.5
Morrison	719.7	167.4	166.4	23.1	--	1.0	18.8	2.6
Olmsted	417.9	40.7	40.7	9.7	--	--	3.8	0.9
Otter Tail	1,267.1	218.2	208.2	16.5	5.5	4.5	35.8	2.8
Pine	903.1	520.7	486.4	53.5	0.6	33.7	24.0	2.6
Ramsey	99.7	--	--	--	--	--	9.0	9.1
Rice	318.5	20.0	19.8	6.2	--	0.2	2.0	0.6
Scott	228.4	16.4	14.2	6.2	--	2.2	6.9	3.0
Sherburne	279.4	53.4	50.7	18.2	1.9	0.8	13.6	4.9
Stearns	860.5	69.2	69.2	8.1	--	--	24.1	2.8
Todd	602.9	97.6	97.6	16.2	--	--	10.5	1.7
Wabasha	336.0	67.9	67.9	19.8	--	--	4.0	1.2
Washington	250.7	31.4	23.8	9.5	1.5	6.1	11.8	4.7
Winona	400.9	130.2	127.7	31.7	--	2.5	2.0	0.5
Wright	422.9	51.3	50.5	11.7	--	0.8	21.4	5.0
Total	11,929.0	2,358.0	2,275.4	19.0	13.8	68.8	344.5	2.9

(Table 1 continued on next page)

(Table 1 continued)

Unit and county	Land area	Forest land					Nonforest land with trees	Nonforest land with trees, as a percent of land area
		All forest land	Timber-land	Timberland as a percent of land area	Other forest land	Reserved forest land		
Prairie Unit,								
Big Stone	318.1	3.0	3.0	0.9	--	--	3.2	0.9
Blue Earth	481.5	35.2	35.2	7.2	--	--	3.2	0.7
Brown	391.0	13.1	13.1	3.3	--	--	9.6	2.4
Chippewa	373.0	9.4	9.4	2.4	--	--	3.8	1.0
Clay	669.0	22.6	22.6	3.3	--	--	4.9	0.7
Cottonwood	409.6	5.0	5.0	1.2	--	--	9.5	2.2
Dodge	281.3	7.9	7.9	2.7	--	--	6.1	2.1
Faribault	456.7	11.3	11.3	2.4	--	--	--	--
Freeborn	452.9	9.4	9.4	2.1	--	--	--	--
Grant	349.7	5.6	5.6	1.6	--	--	2.9	0.8
Jackson	449.2	2.7	2.7	0.6	--	--	--	--
Kandiyohi	509.6	22.5	21.1	4.0	--	1.4	8.1	1.5
Kittson	702.1	72.1	65.1	9.1	4.2	2.8	5.3	0.7
Lac Qui Parle	489.5	7.0	7.0	1.4	--	--	11.3	2.2
Lincoln	343.7	--	--	--	--	--	2.8	0.8
Lyon	457.1	2.4	2.4	0.5	--	--	2.8	0.6
McLeod	314.8	8.5	8.5	2.6	--	--	9.8	3.1
Marshall	1,134.3	137.1	133.3	11.6	3.8	--	9.9	0.9
Martin	454.0	4.0	4.0	0.9	--	--	3.8	0.8
Meeker	389.5	20.9	20.9	5.2	--	--	17.2	4.2
Mower	455.4	6.9	6.9	1.5	--	--	1.2	0.3
Murray	450.9	5.0	3.6	0.8	--	1.4	5.0	1.1
Nicollet	289.5	15.4	14.7	5.0	--	0.7	2.1	0.7
Nobles	457.9	--	--	--	--	--	--	--
Norman	560.8	25.8	25.8	4.6	--	--	10.8	1.9
Pennington	394.6	34.8	34.8	8.7	--	--	4.2	1.1
Pipestone	298.2	1.2	1.2	0.4	--	--	--	--
Polk	1,261.1	59.6	58.5	4.6	1.1	--	3.3	0.3
Pope	428.9	12.4	12.4	2.9	--	--	11.7	2.7
Red Lake	276.8	27.3	27.3	10.7	--	--	0.9	0.4
Redwood	563.1	9.4	9.4	1.7	--	--	5.5	1.0
Renville	629.1	6.9	6.9	1.2	--	--	1.4	0.2
Rock	308.9	--	--	--	--	--	--	--
Sibley	376.7	23.6	22.9	6.4	--	0.7	3.8	1.1
Steele	274.9	10.0	9.4	3.6	--	0.6	7.9	3.0
Stevens	359.7	3.0	3.0	0.9	--	--	2.8	0.8
Swift	475.9	2.2	2.2	0.5	--	--	3.8	0.8
Traverse	367.4	--	--	--	--	--	3.8	1.1
Waseca	270.9	11.8	11.8	4.5	--	--	5.8	2.2
Watonwan	278.1	2.2	2.2	0.8	--	--	3.8	1.5
Wilkin	480.9	--	--	--	--	--	--	--
Yellow Medicine	485.1	3.3	3.3	0.7	--	--	4.1	0.9
Total	19,171.4	660.5	643.8	3.4	9.1	7.6	196.1	1.0
All counties	50,954.2	16,718.0	14,773.4	29.0	828.3	1,116.3	949.8	1.9

Table 2.--Area of timberland by county and ownership class, Minnesota, 1990

(In thousand acres)

Unit and county	All owners	Ownership class									
		National forest	Bureau of Land Mgmt.	Misc. federal	State	County & municipal	Indian	Forest industry	Farmer	Misc. private corporation	Misc. private individual
Aspen-Birch Unit											
Carlton	340.5	--	--	--	58.9	58.0	10.4	27.0	49.5	12.4	124.3
Cook	565.4	362.8	--	2.3	75.0	9.2	32.7	26.2	1.1	18.0	38.1
Koochiching	1,423.9	--	12.1	17.5	734.4	278.8	35.3	203.1	28.5	17.1	97.1
Lake	850.1	384.6	--	3.3	106.7	143.6	--	78.3	6.7	43.7	83.2
St. Louis	2698.8	506.5	1.4	8.9	356.3	744.8	24.0	127.7	120.7	250.7	557.8
Total	5,878.7	1,253.9	13.5	32.0	1,331.3	1,234.4	102.4	462.3	206.5	341.9	900.5
Northern Pine Unit											
Aitkin	710.9	--	--	7.9	255.9	197.8	--	11.3	71.3	6.3	160.4
Becker	332.3	--	--	26.2	20.2	87.6	2.3	4.7	69.5	6.0	115.8
Beltrami	841.8	57.8	--	--	246.1	140.0	203.9	2.0	78.6	8.4	105.0
Cass	841.6	241.1	--	3.0	104.7	232.9	18.4	32.4	43.5	15.3	150.3
Clearwater	289.4	--	--	2.6	25.8	66.8	57.0	2.9	70.9	2.7	60.7
Crow Wing	386.7	--	--	--	20.4	89.6	--	16.5	39.4	27.7	193.1
Hubbard	399.8	--	--	0.9	52.1	121.2	--	21.5	31.4	8.0	164.7
Itasca	1,324.4	268.3	--	--	253.8	255.7	2.3	169.0	38.0	71.3	266.0
Lake of the Woods	398.4	--	12.6	7.9	230.6	3.1	75.2	2.2	14.6	3.1	49.1
Mahnomen	113.9	--	--	11.3	23.6	5.7	16.6	--	42.2	--	14.5
Roseau	217.2	--	--	10.7	123.9	3.4	4.9	--	55.5	3.2	15.6
Wadena	119.1	--	--	--	13.4	0.8	--	22.5	41.8	3.3	37.3
Total	5,975.5	567.2	12.6	70.5	1,370.5	1,204.6	380.6	285.0	596.7	155.3	1,332.5
Central Hardwood Unit											
Anoka-Dakota-Ramsey-Washington	70.4	--	--	--	6.6	1.0	--	--	31.9	8.6	22.3
Benton-Sherburne	85.4	--	--	18.2	8.6	--	--	--	35.5	1.3	21.8
Carver-Hennepin-Scott	44.9	--	--	2.1	6.2	3.9	--	--	18.2	2.1	12.4
Chisago-Isanti	102.7	--	--	--	7.5	3.7	--	--	45.7	3.7	42.1
Douglas-Todd	129.2	--	--	6.9	6.1	1.6	--	--	69.3	3.1	42.2
Fillmore-Olmsted	139.3	--	--	--	13.0	1.8	--	1.4	94.7	3.0	25.4
Goodhue	69.4	--	--	3.1	6.2	0.8	--	--	48.1	3.2	8.0
Houston	133.9	--	--	6.6	8.8	--	1.2	--	96.9	2.2	18.2
Kanabec	142.2	--	--	--	14.9	7.8	--	--	41.6	1.3	76.6
LeSueur-Rice	43.3	--	--	--	3.2	0.9	--	--	24.0	--	15.2
Mille Lacs	138.4	--	--	4.8	33.8	--	5.0	--	39.7	0.5	54.6
Morrison	166.4	--	--	0.7	30.4	--	--	--	61.2	19.0	55.1
Otter Tail	208.2	--	--	--	3.3	1.2	--	--	155.3	7.5	40.9
Pine	486.4	--	--	3.1	111.5	32.3	1.4	2.6	112.2	24.8	198.5
Stearns	69.2	--	--	--	--	0.9	--	--	37.1	3.2	28.0
Wabasha	67.9	--	--	6.5	10.1	--	--	--	33.3	3.5	14.5
Winona	127.7	--	--	3.3	25.2	2.0	--	--	78.3	5.6	13.3
Wright	50.5	--	--	--	2.8	1.7	--	--	34.3	2.3	9.4
Total	2,275.4	--	--	55.3	298.2	59.6	7.6	4.0	1,057.3	94.9	698.5

(Table 2 continued on next page)

(Table 2 continued)

Unit and county	All owners	Ownership class									
		National forest	Bureau of Land Mgmt.	Misc. federal	State	County & municipal	Indian	Forest industry	Farmer	Misc. private corporation	Misc. private individual
Prairie Unit											
Blue Earth-Faribault	32.0	--	--	0.4	1.2	0.7	--	--	20.7	1.1	7.9
Clay-Norman	38.5	--	--	0.9	3.4	0.6	--	--	23.6	1.5	8.5
Eastern Group[1]	34.7	--	--	0.3	2.3	0.2	--	--	22.2	1.0	8.7
Kandiyohi-Meeker	39.9	--	--	0.5	2.6	0.3	--	--	25.6	1.3	9.6
Kittson	54.0	--	--	1.6	9.9	0.6	--	--	27.8	1.9	12.2
Marshall	138.7	--	--	4.4	30.8	0.7	--	--	66.0	4.1	32.7
Northern Group[2]	67.7	--	--	0.7	3.4	0.8	--	--	43.7	1.9	17.2
Pennington-Red Lake	59.9	--	--	1.7	10.2	0.7	--	--	31.6	1.8	13.9
Polk	55.7	--	--	1.4	7.8	0.9	--	--	30.6	1.7	13.3
Southern Group[3]	40.9	--	--	0.6	2.3	0.4	--	--	26.6	1.4	9.6
Western Group[4]	81.8	--	--	1.3	4.0	1.1	--	--	53.3	3.2	18.9
Total	643.8	--	--	13.8	77.9	7.0	--	--	371.7	20.9	152.5
All counties	14,773.4	1,821.1	26.1	171.6	3,077.9	2,505.6	490.6	751.3	2,232.2	613.0	3,084.0

[1]Includes: Dodge, Freeborn, Mower, Steele, and Waseca Counties.

[2]Includes: McLeod, Nicollet, Renville, and Sibley Counties.

[3]Includes: Brown, Cottonwood, Jackson, Martin, Redwood, and Watonwan Counties.

[4]Includes: Big Stone, Chippewa, Grant, Lac Qui Parle, Lincoln, Lyon, Murray, Nobles, Pipestone, Pope, Rock, Stevens, Swift, Traverse, Wilkin, and Yellow Medicine Counties.

Table 3.--Area of timberland by county and forest type, Minnesota, 1990

(In thousand acres)

Unit and county	All types	Forest type: Jack pine	Red pine	White pine	Balsam fir	White spruce	Black spruce	Northern white-cedar	Tamarack	Oak-hickory	Elm-ash-soft maple	Maple bass-wood	Aspen	Paper birch	Balsam poplar	Non-stocked
Aspen-Birch Unit																
Carlton	340.5	--	5.9	0.6	14.3	2.3	22.1	4.8	25.1	3.2	43.0	29.5	145.1	21.7	15.1	7.8
Cook	565.4	9.1	7.8	3.6	92.9	16.1	62.6	52.5	3.5	--	14.1	42.3	182.6	71.5	4.2	2.6
Koochiching	1,423.9	17.4	19.0	1.7	90.5	8.2	332.6	226.0	98.8	1.3	129.3	19.9	374.3	24.8	67.6	12.5
Lake	850.1	25.6	29.4	8.7	124.6	18.5	133.1	51.3	3.8	1.5	33.4	60.8	189.9	153.2	12.6	3.7
St. Louis	2,698.8	85.9	58.9	18.7	223.5	21.1	392.8	109.4	124.1	3.3	168.0	112.0	1,099.2	187.0	57.1	37.8
Total	5,878.7	138.0	121.0	33.3	545.8	66.2	943.2	444.0	255.3	9.3	387.8	264.5	1,991.1	458.2	156.6	64.4
Northern Pine Unit																
Aitkin	710.9	1.3	5.5	--	13.8	1.5	56.7	18.8	81.1	24.4	94.5	127.8	223.7	37.5	9.0	15.3
Becker	332.3	10.8	3.4	1.2	9.4	--	3.0	--	19.8	47.8	20.6	49.8	145.6	16.7	2.0	2.2
Beltrami	841.8	30.2	20.9	1.2	17.3	3.7	48.1	59.7	83.7	19.1	71.7	56.9	313.4	35.6	66.1	14.2
Cass	841.6	46.8	38.7	6.0	17.5	1.1	16.5	40.9	35.6	51.2	49.3	70.1	376.7	71.2	14.8	5.2
Clearwater	289.4	4.7	6.0	0.9	11.4	--	6.5	7.8	10.6	7.3	19.4	31.1	144.7	14.3	20.5	4.2
Crow Wing	386.7	32.8	5.4	2.3	0.8	--	9.2	0.9	15.0	81.2	38.1	23.6	150.9	23.7	--	2.8
Hubbard	399.8	59.4	19.4	2.3	14.1	3.1	5.2	0.9	11.0	17.5	21.9	15.1	199.6	24.7	3.3	2.3
Itasca	1,324.4	30.9	45.1	6.9	75.8	11.8	119.9	68.5	68.4	12.1	128.3	86.8	530.5	83.0	48.5	7.9
Lake of the Woods	398.4	23.1	4.7	--	14.3	3.3	69.3	33.6	53.8	1.8	11.5	--	123.9	10.1	29.7	19.3
Mahnomen	113.9	--	--	--	0.9	1.1	--	--	1.0	17.6	7.7	33.9	45.0	3.1	1.8	1.8
Roseau	217.2	21.2	3.6	--	4.0	1.8	13.8	5.4	20.5	1.0	19.7	--	91.5	--	32.5	2.2
Wadena	119.1	29.5	14.3	3.5	0.9	--	--	--	3.3	23.1	6.9	1.4	33.6	1.3	1.3	--
Total	5,975.5	290.7	167.0	24.3	180.2	27.4	348.2	236.5	403.8	304.1	489.6	496.5	2,379.1	321.2	229.5	77.4
Central Hardwood Unit																
Anoka-Dakota-Ramsey-Washington	70.4	0.6	--	--	--	--	--	--	--	32.9	7.9	20.3	5.8	2.9	--	--
Benton-Sherburne	85.4	3.6	2.4	--	--	--	--	--	--	58.3	10.3	5.4	5.4	--	--	--
Carver-Hennepin-Scott	44.9	--	--	--	--	--	--	--	--	21.3	12.5	10.5	0.6	--	--	--
Chisago-Isanti	102.7	0.4	3.2	--	--	0.2	2.4	--	2.8	39.7	20.0	19.5	11.2	2.2	--	1.1
Douglas-Todd	129.2	1.1	--	--	--	--	--	--	3.8	47.1	28.3	21.3	23.3	2.0	1.2	1.1
Fillmore-Olmsted	139.3	--	--	--	--	--	--	--	--	85.5	17.8	33.3	2.7	--	--	--
Goodhue	69.4	--	--	--	--	--	--	--	--	24.5	14.5	16.3	8.9	4.6	--	0.6
Houston	133.9	--	--	--	--	--	--	--	--	92.7	11.4	16.8	6.7	6.3	--	--
Kanabec	142.2	--	--	--	--	--	2.2	--	1.6	27.5	16.3	31.4	54.2	4.1	1.1	3.8
LeSueur-Rice	43.3	--	--	--	--	--	--	--	--	4.4	11.7	25.2	0.8	--	--	1.2
Mille Lacs	138.4	--	--	--	--	--	--	--	4.8	21.5	25.6	35.3	44.8	6.4	--	--
Morrison	166.4	2.0	3.8	2.4	--	--	--	--	4.0	50.8	9.4	22.4	67.6	4.0	--	--
Otter Tail	208.2	2.8	--	0.2	--	--	--	--	8.2	51.0	23.8	62.7	48.8	4.1	5.4	1.2
Pine	486.4	8.3	3.1	2.0	8.3	--	24.1	--	14.1	28.9	52.3	76.1	245.6	18.8	3.6	1.2
Stearns	69.2	--	--	--	--	--	--	--	1.5	21.5	19.2	23.0	--	--	2.4	1.6
Wabasha	67.9	--	--	--	--	--	--	--	--	48.3	3.9	12.0	3.7	--	--	--
Winona	127.7	--	--	--	--	--	--	--	--	91.3	15.4	17.9	1.0	1.0	--	1.1
Wright	50.5	--	--	--	--	--	--	--	--	5.9	10.8	25.6	1.0	--	--	7.2
Total	2,275.4	18.8	12.5	4.6	8.3	0.2	28.7	--	40.8	753.1	311.1	475.0	532.1	56.4	13.7	20.1

(Table 3 continued on next page)

(Table 3 continued)

Unit and county	All types	Forest type														
		Jack pine	Red pine	White pine	Balsam fir	White spruce	Black spruce	Northern white-cedar	Tamarack	Oak-hickory	Elm-ash-soft maple	Maple bass-wood	Aspen	Paper birch	Balsam poplar	Non-stocked
Prairie Unit																
Blue Earth-Faribault	32.0	--	--	--	--	--	--	--	0.2	8.3	8.1	11.8	3.1	--	0.1	0.4
Clay-Norman	38.5	--	--	0.1	--	--	0.1	--	--	6.5	8.2	11.3	10.3	--	1.3	0.7
Eastern Group[1]	34.7	--	--	0.1	--	--	0.1	--	--	13.0	5.5	13.0	2.5	--	0.2	0.3
Kandiyohi-Meeker	39.9	--	--	0.1	--	--	0.1	--	--	12.8	7.0	14.8	4.3	--	0.4	0.4
Kittson	54.0	--	0.2	0.1	--	--	0.3	--	0.7	5.6	6.9	7.7	28.1	--	3.8	0.6
Marshall	138.7	--	0.5	0.2	--	--	0.6	--	3.7	13.0	10.6	9.3	87.0	--	12.6	1.2
Northern Group[2]	67.7	--	--	0.1	--	--	0.1	--	--	18.5	13.0	29.1	5.8	--	0.4	0.7
Pennington-Red Lake	59.9	--	0.2	0.1	--	--	0.3	--	0.2	7.3	7.2	9.4	30.4	--	4.3	0.5
Polk	55.7	--	0.2		--	--	0.2	--	0.2	6.1	8.8	11.2	25.1	--	3.4	0.5
Southern Group[3]	40.9	--	--	0.1	--	--	0.1	--	--	11.7	8.4	15.4	4.3	--	0.4	0.5
Western Group[4]	81.8	--	--	0.1	--	--	0.1	--	0.2	20.0	19.3	28.9	11.0	--	1.0	1.2
Total	643.8	--	1.1	1.0	--	--	2.0	--	5.2	122.8	--	161.9	211.9	--	27.9	7.0
All counties	14,773.4	447.5	301.6	63.2	734.3	93.8	1,322.1	680.5	705.1	1,184.3	1,291.5	1,402.9	5,114.2	835.8	427.7	168.9

[1]Includes: Dodge, Freeborn, Mower, Steele, and Waseca Counties.

[2]Includes: McLeod, Nicollet, Renville, and Sibley Counties.

[3]Includes: Brown, Cottonwood, Jackson, Martin, Redwood, and Watonwan Counties.

[4]Includes: Big Stone, Chippewa, Grant, Lac Qui Parle, Lincoln, Lyon, Murray, Nobles, Pipestone, Pope, Rock, Stevens, Swift, Traverse, Wilkin, and Yellow Medicine Counties.

Table 4.--Area of timberland by county and stand-size class, Minnesota, 1990

(In thousand acres)

Unit and county	All stands	Stand-size class			
		Sawtimber	Poletimber	Sapling & Seedling	Nonstocked
Aspen-Birch Unit					
Carlton	340.5	72.8	139.8	120.1	7.8
Cook	565.4	207.1	214.2	141.5	2.6
Koochiching	1,423.9	273.5	524.9	613.0	12.5
Lake	850.1	240.7	317.1	288.6	3.7
St. Louis	2,698.8	708.2	972.7	980.1	37.8
Total	5,878.7	1,502.3	2,168.7	2,143.3	64.4
Northern Pine Unit					
Aitkin	710.9	235.2	274.6	185.8	15.3
Becker	332.3	141.8	137.0	51.3	2.2
Beltrami	841.8	253.4	321.5	252.7	14.2
Cass	841.6	319.2	314.3	202.9	5.2
Clearwater	289.4	96.5	113.2	75.5	4.2
Crow Wing	386.7	159.2	146.2	78.5	2.8
Hubbard	399.8	104.0	199.6	93.9	2.3
Itasca	1,324.4	427.4	432.3	456.8	7.9
Lake of the Woods	398.4	90.6	142.7	145.8	19.3
Mahnomen	113.9	30.5	54.3	27.3	1.8
Roseau	217.2	49.9	76.9	88.2	2.2
Wadena	119.1	34.4	43.6	41.1	--
Total	5,975.5	1,942.1	2,256.2	1,699.8	77.4
Central Hardwood Unit					
Anoka-Dakota-Ramsey-Washington	70.4	47.6	19.6	3.2	--
Benton-Sherburne	85.4	49.5	19.8	16.1	--
Carver-Hennepin-Scott	44.9	28.5	6.0	10.4	--
Chisago-Isanti	102.7	46.4	28.9	26.3	1.1
Douglas-Todd	129.2	68.2	36.3	23.6	1.1
Fillmore-Olmsted	139.3	104.4	20.8	14.1	--
Goodhue	69.4	54.6	10	4.2	0.6
Houston	133.9	98.1	14.3	21.5	--
Kanabec	142.2	49.3	49.0	40.1	3.8
LeSueur-Rice	43.3	28.9	3.5	9.7	1.2
Mille Lacs	138.4	51.1	59.7	27.6	--
Morrison	166.4	63.0	85.2	18.2	--
Otter Tail	208.2	96.3	67.0	43.7	1.2
Pine	486.4	131.4	210.4	143.4	1.2
Stearns	69.2	39.9	18.1	9.6	1.6
Wabasha	67.9	51.3	12.1	4.5	--
Winona	127.7	96.7	22.0	7.9	1.1
Wright	50.5	33.1	3.5	6.7	7.2
Total	2,275.4	1,138.3	686.2	430.8	20.1
Prairie Unit					
Blue Earth-Faribault	46.5	37.7	2.4	6.4	--
Clay-Norman	48.4	30.9	8.8	8.7	--
Eastern Group	45.4	36.1	4.4	4.9	--
Kandiyohi-Meeker	42.0	35.4	1.9	4.7	--
Kittson	65.1	6.0	31.8	27.3	--
Marshall	133.3	15.3	46.1	70.8	1.1
Northern Group	53.0	38.4	2.3	8.3	4.0
Pennington-Red Lake	62.1	18.9	19.9	23.3	--
Polk	58.5	31.2	19.8	7.5	--
Southern Group	36.4	25.2	4.8	6.4	--
Western Group	53.1	37.5	7.3	6.4	1.9
Total	643.8	312.6	149.5	174.7	7.0
All counties	14,773.4	4,895.3	5,260.6	4,448.6	168.9

Table 5.--Area of timberland by county and potential productivity class, Minnesota, 1990

(In thousand acres)

Unit and county	All classes	Potential productivity class (cubic feet of growth per acre per year)				
		165+	120-164	85-119	50-84	20-49
Aspen-Birch Unit						
Carlton	340.5	--	2.6	53.4	87.6	196.9
Cook	565.4	--	--	19.9	131.2	414.3
Koochiching	1,423.9	--	7.6	163.4	205.5	1,047.4
Lake	850.1	--	1.3	40.8	148.9	659.1
St. Louis	2,698.8	0.9	14.8	376.8	691.8	1,614.5
Total	5,878.7	0.9	26.3	654.3	1,265.0	3,932.2
Northern Pine Unit						
Aitkin	710.9	--	6.1	130.8	138.7	435.3
Becker	332.3	--	1.0	56.3	103.3	171.7
Beltrami	841.8	--	7.6	127.7	191.8	514.7
Cass	841.6	1.5	15.1	193.4	269.1	362.5
Clearwater	289.4	--	3.6	76.9	73.7	135.2
Crow Wing	386.7	--	--	35.8	163.0	187.9
Hubbard	399.8	--	4.8	85.1	149.0	160.9
Itasca	1,324.4	1.6	26.7	385.6	266.4	644.1
Lake of the Woods	398.4	--	--	36.5	84.0	277.9
Mahnomen	113.9	--	--	18.3	32.5	63.1
Roseau	217.2	--	1.8	8.7	63.7	143.0
Wadena	119.1	--	3.0	20.8	52.0	43.3
Total	5,975.5	3.1	69.7	1,175.9	1,587.2	3,139.6
Central Hardwood Unit						
Anoka-Dakota-Ramsey-Washington	70.4	--	--	8.0	42.1	20.3
Benton-Sherburne	85.4	--	1.5	1.8	30.4	51.7
Carver-Hennepin-Scott	44.9	--	--	8.1	19.2	17.6
Chisago-Isanti	102.7	--	2.4	10.9	35.9	53.5
Douglas-Todd	129.2	--	--	18.0	45.1	66.1
Fillmore-Olmsted	139.3	--	1.1	23.0	39.1	76.1
Goodhue	69.4	--	--	21.3	23.9	24.2
Houston	133.9	--	3.1	16.4	58.3	56.1
Kanabec	142.2	1.0	1.2	38.1	53.9	48.0
LeSueur-Rice	43.3	--	--	20.0	10.1	13.2
Mille Lacs	138.4	--	--	21.3	52.0	65.1
Morrison	166.4	--	1.3	33.8	67.1	64.2
Otter Tail	208.2	--	--	25.7	54.3	128.2
Pine	486.4	--	4.7	129.7	159.2	192.8
Stearns	69.2	--	--	2.8	17.5	48.9
Wabasha	67.9	0.3	2.3	11.2	28.3	25.8
Winona	127.7	--	1.0	13.1	51.6	62.0
Wright	50.5	--	--	4.7	27.6	18.2
Total	2,275.4	1.3	18.6	407.9	815.6	1,032.0
Prairie Unit						
Blue Earth-Faribault	46.5	2.0	--	10.7	12.3	21.5
Clay-Norman	48.4	--	--	3.6	21.5	23.3
Eastern Group	45.4	1.9	--	1.9	13.8	27.8
Kandiyohi-Meeker	42.0	--	--	6.2	15.7	20.1
Kittson	65.1	--	--	9.2	24.7	31.2
Marshall	133.3	--	--	15.2	60.5	57.6
Northern Group	53.0	--	6.2	12.4	16.2	18.2
Pennington-Red Lake	62.1	--	--	8.1	24.1	29.9
Polk	58.5	--	--	9.7	19.9	28.9
Southern Group	36.4	--	1.2	8.2	8.6	18.4
Western Group	53.1	--	--	7.4	15.2	30.5
Total	643.8	3.9	7.4	92.6	232.5	307.4
All counties	14,773.4	9.2	122.0	2,330.7	3,900.3	8,411.2

Table 6.--Area of timberland by county and stocking class of growing-stock trees, Minnesota, 1990

(In thousand acres)

Unit and county	All classes	Stocking class of growing-stock trees				
		Nonstocked	Poorly stocked	Moderately stocked	Fully stocked	Over-stocked
Aspen-Birch Unit						
Carlton	340.5	10.5	81.6	97.8	104.2	46.4
Cook	565.4	4.0	63.8	168.0	228.5	101.1
Koochiching	1,423.9	14.0	210.3	400.6	419.9	379.1
Lake	850.1	7.8	127.1	311.1	283.1	121.0
St. Louis	2,698.8	58.0	462.3	962.0	789.1	427.4
Total	5,878.7	94.3	945.1	1,939.5	1,824.8	1,075.0
Northern Pine Unit						
Aitkin	710.9	18.9	167.7	265.1	176.5	82.7
Becker	332.3	2.2	71.0	158.3	84.9	15.9
Beltrami	841.8	17.1	168.3	305.9	238.1	112.4
Cass	841.6	5.2	119.8	300.7	298.4	117.5
Clearwater	289.4	5.1	67.8	105.3	81.7	29.5
Crow Wing	386.7	3.9	76.4	177.0	93.5	35.9
Hubbard	399.8	2.3	72.4	174.6	108.6	41.9
Itasca	1,324.4	16.2	193.8	492.7	388.5	233.2
Lake of the Woods	398.4	27.0	90.9	124.9	106.0	49.6
Mahnomen	113.9	1.8	18.8	50.0	28.6	14.7
Roseau	217.2	3.6	62.3	70.7	59.7	20.9
Wadena	119.1	--	34.1	63.7	16.9	4.4
Total	5,975.5	103.3	1,143.3	2,288.9	1,681.4	758.6
Central Hardwood Unit						
Anoka-Dakota-Ramsey-Washington	70.4	--	24.7	39.2	6.5	--
Benton-Sherburne	85.4	3.7	37.0	36.0	5.5	3.2
Carver-Hennepin-Scott	44.9	1.7	15.0	18.7	8.5	1.0
Chisago-Isanti	102.7	1.1	51.9	35.4	11.9	2.4
Douglas-Todd	129.2	3.6	34.0	71.4	19.7	0.5
Fillmore-Olmstead	139.3	5.5	46.5	64.1	23.2	--
Goodhue	69.4	1.4	19.8	34.0	13.1	1.1
Houston	133.9	--	32.0	73.1	26.4	2.4
Kanabec	142.2	4.9	39.4	71.0	19.4	7.5
LeSueur-Rice	43.3	1.2	7.9	30.7	3.5	--
Mille Lacs	138.4	3.2	37.8	58.2	30.3	8.9
Morrison	166.4	--	42.1	91.9	25.7	6.7
Otter Tail	208.2	5.7	82.6	92.1	23.0	4.8
Pine	486.4	2.4	141.7	207.0	105.4	29.9
Stearns	69.2	6.2	27.1	31.1	4.8	--
Wabasha	67.9	--	18.7	44.1	5.1	--
Winona	127.7	2.1	32.2	72.3	20.0	1.1
Wright	50.5	9.2	16.1	21.8	3.4	--
Total	2,275.4	51.9	706.5	1,092.1	355.4	69.5
Prairie Unit						
Blue Earth-Faribault	46.5	2.0	12.3	27.4	4.8	--
Clay-Norman	48.4	0.9	13.2	21.7	9.0	3.6
Eastern Group	45.4	1.9	21.4	18.3	3.8	--
Kandiyohi-Meeker	42.0	1.5	10.6	29.9	--	--
Kittson	65.1	3.4	16.5	17.0	15.9	12.3
Marshall	133.3	2.2	34.1	44.1	34.4	18.5
Northern Group	53.0	4.0	8.2	25.9	13.8	1.1
Pennington-Red Lake	62.1	--	17.5	30.4	10.9	3.3
Polk	58.5	2.2	18.8	29.7	6.7	1.1
Southern Group	36.4	--	10.5	21.5	1.5	2.9
Western Group	53.1	3.0	24.2	21.7	2.7	1.5
Total	643.8	21.1	187.3	287.6	103.5	44.3
All counties	14,773.4	270.6	2,982.2	5,608.1	3,965.1	1,947.4

Table 7.--Area of timberland by ownership class, stocking class of growing-stock trees, and Forest Survey Unit, Minnesota, 1990

(In thousand acres)

Unit and county	All classes	Stocking class of growing stock trees				
		Nonstocked	Poorly stocked	Moderately stocked	Fully stocked	Over-stocked
All Units						
National forest	1,821.1	16.2	137.5	542.3	739.4	385.7
Bureau of Land Mgmt.	26.1	1.1	5.8	5.5	8.7	5.0
Miscellaneous federal	171.6	2.9	44.6	77.7	31.6	14.8
State	3,077.9	76.2	569.2	1,007.4	872.0	553.1
County and municipal	2,505.6	42.8	485.1	919.5	684.7	373.5
Indian	490.6	11.8	105.2	174.7	122.4	76.5
Forest industry	751.3	5.6	111.7	257.7	232.7	143.6
Farmer	2,232.2	64.8	647.6	1,055.9	373.0	90.9
Misc. private corporation	613.0	6.5	114.1	259.6	160.5	72.3
Misc. private individual	3,084.0	42.7	761.4	1,307.8	740.1	232.0
All owners	14,773.4	270.6	2,982.2	5,608.1	3,965.1	1,947.4
Aspen-Birch Unit						
National forest	1,253.9	13.8	93.6	384.9	515.2	246.4
Bureau of Land Mgmt.	13.5	--	1.4	1.1	6.0	5.0
Miscellaneous federal	32.0	--	5.4	9.8	8.7	8.1
State	1,331.3	18.9	184.5	398.4	415.2	314.3
County and municipal	1,234.4	26.4	252.1	430.2	321.7	204.0
Indian	102.4	--	18.6	30.4	29.1	24.3
Forest industry	462.3	2.5	59.8	142.0	149.2	108.8
Farmer	206.5	8.0	27.3	79.3	67.3	24.6
Misc. private corporation	341.9	4.4	47.5	146.5	94.0	49.5
Misc. private individual	900.5	20.3	254.9	316.9	218.4	90.0
All owners	5,878.7	94.3	945.1	1,939.5	1,824.8	1,075.0
Northern Pine Unit						
National forest	567.2	2.4	43.9	157.4	224.2	139.3
Bureau of Land Mgmt.	12.6	1.1	4.4	4.4	2.7	--
Miscellaneous federal	70.5	1.8	18.5	35.8	11.1	3.3
State	1,370.5	50.0	288.2	446.5	386.7	199.1
County and municipal	1,204.6	15.6	210.6	467.3	343.2	167.9
Indian	380.6	11.8	86.1	139.0	91.5	52.2
Forest industry	285.0	3.1	51.3	113.7	82.1	34.8
Farmer	596.7	11.0	157.1	277.2	117.7	33.7
Misc. private corporation	155.3	--	29.5	60.0	47.7	18.1
Misc. private individual	1,332.5	6.5	253.7	587.6	374.5	110.2
All owners	5,975.5	103.3	1,143.3	2,288.9	1,681.4	758.6
Central Hardwood Unit						
Miscellaneous federal	55.3	--	18.4	29.0	6.7	1.2
State	298.2	2.9	74.7	144.8	52.7	23.1
County and municipal	59.6	0.8	17.8	22.0	17.4	1.6
Indian	7.6	--	0.5	5.3	1.8	--
Forest industry	4.0	--	0.6	2.0	1.4	--
Farmer	1,057.3	33.2	356.4	517.7	134.4	15.6
Misc. private corporation	94.9	0.2	28.6	44.8	17.7	3.6
Misc. private individual	698.5	14.8	209.5	326.5	123.3	24.4
All owners	2,275.4	51.9	706.5	1,092.1	355.4	69.5
Prairie Unit						
National forest	--	--	--	--	--	--
Bureau of Land Mgmt.	--	--	--	--	--	--
Miscellaneous federal	13.8	1.1	2.3	3.1	5.1	2.2
State	77.9	4.4	21.8	17.7	17.4	16.6
County and municipal	7.0	--	4.6	--	2.4	--
Indian	--	--	--	--	--	--
Forest industry	--	--	--	--	--	--
Farmer	371.7	12.6	106.8	181.7	53.6	17.0
Misc. private corporation	20.9	1.9	8.5	8.3	1.1	1.1
Misc. private individual	152.5	1.1	43.3	76.8	23.9	7.4
All owners	643.8	21.1	187.3	287.6	103.5	44.3

Table 8.--Area of timberland by forest type and ownership class, Minnesota, 1990

(In thousand acres)

Forest type	All owners	Ownership class									
		National forest	Bureau of Land Mgmt.	Misc. federal	State	County & municipal	Indian	Forest industry	Farmer	Misc. private corporation	Misc. private individual
Jack pine	447.5	74.2	2.0	5.0	93.2	70.4	5.8	51.0	31.8	12.5	101.6
Red pine	301.6	107.8	0.9	4.9	51.1	39.6	12.6	27.8	6.5	5.2	45.2
White pine	63.2	15.3	--	0.9	5.7	4.7	1.9	6.0	4.8	5.1	18.8
Balsam fir	734.3	190.5	--	1.3	150.7	154.2	12.9	69.7	33.5	35.6	85.9
White spruce	93.8	28.3	1.0	--	17.3	14.0	2.8	11.6	1.5	1.8	15.5
Black spruce	1,322.1	248.8	10.3	9.2	561.9	206.0	41.9	62.7	32.7	37.9	110.7
Northern white-cedar	680.5	92.0	2.4	7.8	288.1	111.9	60.6	47.2	10.5	14.6	45.4
Tamarack	705.1	32.3	1.0	4.9	321.7	123.3	43.8	9.1	44.3	18.0	106.7
Oak-hickory	1,184.3	11.0	--	41.8	106.3	57.5	8.1	6.9	576.4	44.7	331.6
Elm-ash-soft maple	1,291.5	59.1	1.6	19.1	199.6	214.1	40.1	65.5	281.8	51.7	358.9
Maple-basswood	1,402.9	113.8	--	24.1	131.1	187.0	41.5	50.7	436.2	60.4	358.1
Aspen	5,114.2	650.5	5.8	36.3	880.3	1,025.2	160.6	283.4	613.1	243.8	1,215.2
Paper birch	835.8	167.6	--	8.2	108.4	195.4	31.7	35.4	56.7	55.2	177.2
Balsam poplar	427.7	21.1	--	5.2	105.9	76.1	15.9	20.9	74.2	21.6	86.8
Nonstocked	168.9	8.8	1.1	2.9	56.6	26.2	10.4	3.4	28.2	4.9	26.4
All types	14,773.4	1,821.1	26.1	171.6	3,077.9	2,505.6	490.6	751.3	2,232.2	613.0	3,084.0

Table 9.--Area of timberland by forest type, stand-size class, and Forest Survey Unit, Minnesota, 1990

(In thousand acres)

Unit and forest type	All stands	Stand-size class			
		Sawtimber	Poletimber	Sapling & seedling	Nonstocked
All Units					
Jack pine	447.5	206.4	152.5	88.6	--
Red pine	301.6	174.1	70.9	56.6	--
White pine	63.2	52.8	8.5	1.9	--
Balsam fir	734.3	181.5	315.9	236.9	--
White spruce	93.8	31.9	34.1	27.8	--
Black spruce	1,322.1	69.0	448.4	804.7	--
Northern white-cedar	680.5	298.7	277.9	103.9	--
Tamarack	705.1	102.9	252.3	349.9	--
Oak-hickory	1,184.3	785.5	299.4	99.4	--
Elm-ash-soft maple	1,291.5	404.2	505.5	381.8	--
Maple-basswood	1,402.9	763.9	387.6	251.4	--
Aspen	5,114.2	1,513.7	1,844.7	1,755.8	--
Paper birch	835.8	198.9	505.8	131.1	--
Balsam poplar	427.7	111.8	157.1	158.8	--
Nonstocked	168.9	--	--	--	168.9
All types	14,773.4	4,895.3	5,260.6	4,448.6	168.9
Aspen-Birch Unit					
Jack pine	138.0	73.6	30.0	34.4	--
Red pine	121.0	74.1	23.5	23.4	--
White pine	33.3	28.8	2.6	1.9	--
Balsam fir	545.8	123.9	237.0	184.9	--
White spruce	66.2	24.2	23.8	18.2	--
Black spruce	943.2	47.6	331.7	563.9	--
Northern white-cedar	444.0	208.2	157.6	78.2	--
Tamarack	255.3	42.1	69.5	143.7	--
Oak-hickory	9.3	2.9	1.7	4.7	--
Elm-ash-soft maple	387.8	74.5	178.1	135.2	--
Maple-basswood	264.5	117.8	84.3	62.4	--
Aspen	1,991.1	534.9	701.2	755.0	--
Paper birch	458.2	97.4	277.6	83.2	--
Balsam poplar	156.6	52.3	50.1	54.2	--
Nonstocked	64.4	--	--	--	64.4
All types	5,878.7	1,502.3	2,168.7	2,143.3	64.4
Northern Pine Unit					
Jack pine	290.7	127.2	115.5	48.0	--
Red pine	167.0	94.1	39.7	33.2	--
White pine	24.3	18.4	5.9	--	--
Balsam fir	180.2	55.2	75.5	49.5	--
White spruce	27.4	7.7	10.3	9.4	--
Black spruce	348.2	19.9	105.7	222.6	--
Northern white-cedar	236.5	90.5	120.3	25.7	--
Tamarack	403.8	48.9	170.8	184.1	--
Oak-hickory	304.1	125.6	133.1	45.4	--
Elm-ash-soft maple	489.6	141.4	206.0	142.2	--
Maple-basswood	496.5	267.3	185.4	43.8	--
Aspen	2,379.1	803.5	810.5	766.3	--
Paper birch	321.2	86.4	195.9	38.9	--
Balsam poplar	229.5	56.0	81.6	91.9	--
Nonstocked	77.4	--	--	--	77.4
All types	5,975.5	1,942.1	2,256.2	1,699.8	77.4

(Table 9 continued on next page)

(Table 9 continued)

Unit and forest type	All stands	Stand-size class			
		Sawtimber	Poletimber	Sapling & seedling	Nonstocked
Central Hardwood Unit					
Jack pine	18.8	5.6	7.0	6.2	--
Red pine	12.5	4.8	7.7	--	--
White pine	4.6	4.6	--	--	--
Balsam fir	8.3	2.4	3.4	2.5	--
White spruce	0.2	--	--	0.2	--
Black spruce	28.7	1.5	9.9	17.3	--
Northern white-cedar	--	--	--	--	--
Tamarack	40.8	11.9	10.9	18.0	--
Oak-hickory	748.1	558.5	155.8	33.8	--
Elm-ash-soft maple	311.1	119.6	103.8	87.7	--
Maple-basswood	480.0	259.9	99.9	120.2	--
Aspen	532.1	150.9	247.4	133.8	--
Paper birch	56.4	15.1	32.3	9.0	--
Balsam poplar	13.7	3.5	8.1	2.1	--
Nonstocked	20.1	--	--	--	20.1
All types	2,275.4	1,138.3	686.2	430.8	20.1
Prairie Unit					
Jack pine	--	--	--	--	--
Red pine	1.1	1.1	--	--	--
White pine	1.0	1.0	--	--	--
Balsam fir	--	--	--	--	--
White spruce	--	--	--	--	--
Black spruce	2.0	--	1.1	0.9	--
Northern white-cedar	--	--	--	--	--
Tamarack	5.2	--	1.1	4.1	--
Oak-hickory	122.8	98.5	8.8	15.5	--
Elm-ash-soft maple	103.0	68.7	17.6	16.7	--
Maple-basswood	161.9	118.9	18.0	25.0	--
Aspen	211.9	24.4	85.6	101.9	--
Paper birch	--	--	--	--	--
Balsam poplar	27.9	--	17.3	10.6	--
Nonstocked	7.0	--	--	--	7.0
All types	643.8	312.6	149.5	174.7	7.0

Table 10.--Number of all live trees on timberland by species group and diameter class, Minnesota, 1990

(In thousand trees)

Species group	All classes	Diameter class (inches at breast height) 1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods													
Jack pine	164,327	45,333	33,320	33,600	25,947	15,616	6,718	2,696	779	237	55	26	--
Red pine	97,831	20,352	20,952	21,187	14,741	8,000	4,676	3,144	2,086	1,352	767	573	1
White pine	29,585	9,066	5,273	4,629	2,904	2,206	1,615	1,200	753	579	494	747	119
White spruce	78,622	28,790	18,129	13,231	7,860	4,470	2,906	1,460	870	501	254	151	--
Black spruce	1,039,448	514,723	328,948	143,887	40,720	9,028	1,720	262	114	22	11	12	1
Balsam fir	979,673	532,426	245,269	119,462	52,158	20,833	7,160	1,743	476	95	30	21	--
Tamarack	361,404	159,376	101,543	61,864	25,389	8,964	2,906	939	319	51	38	15	--
Eastern redcedar	14,057	7,230	3,404	1,690	1,270	260	144	31	13	12	--	3	--
Northern white-cedar	386,827	131,365	90,485	73,725	47,048	24,361	11,002	5,235	2,187	793	391	232	3
Other softwoods	2,028	351	659	543	301	107	30	28	8	--	--	1	--
Total	3,153,802	1,449,012	847,982	473,818	218,338	93,845	38,877	16,738	7,605	3,642	2,040	1,781	124
Hardwoods													
Select white oak	200,922	70,346	42,281	33,445	19,125	13,324	8,818	5,368	3,442	2,173	1,064	1,356	180
Select red oak	111,795	26,736	12,034	14,400	16,900	15,851	10,193	6,331	4,135	2,322	1,307	1,438	148
Other red oak	6,688	1,464	801	1,100	1,300	419	530	342	278	118	133	184	19
Hickory	17,200	9,425	3,580	1,703	1,211	573	360	209	74	38	18	9	--
Basswood	192,117	78,585	36,178	27,623	18,630	13,604	7,584	4,488	2,424	1,451	703	783	64
Yellow birch	11,748	5,998	2,160	1,065	824	486	344	379	164	125	92	101	10
Hard maple	283,944	150,228	59,083	39,537	16,319	7,878	4,684	2,709	1,728	907	446	409	16
Soft maple	300,337	135,233	82,996	50,646	17,850	7,552	2,750	1,420	746	417	285	343	99
Elm	174,962	91,001	41,007	21,079	9,768	5,226	3,146	1,439	991	517	349	380	59
Black ash	527,551	277,683	124,118	64,093	34,549	15,831	6,848	2,825	989	393	131	86	5
White and green ash	88,731	47,913	16,064	8,943	5,975	4,318	2,515	1,411	751	385	221	207	28
Cottonwood	2,734	663	376	218	275	296	201	116	122	86	94	178	109
Willow	5,651	2,190	264	574	651	642	486	328	187	159	60	89	21
Hackberry	14,715	10,414	2,402	1,061	365	193	93	85	42	32	10	16	2
Balsam poplar	265,832	137,527	47,191	31,213	22,660	14,516	7,180	3,292	1,345	599	197	109	3
Bigtooth aspen	73,000	38,160	7,852	6,112	6,339	6,091	4,543	2,326	980	399	139	58	1
Quaking aspen	1,986,691	1,213,407	293,738	160,361	122,072	92,211	56,894	28,490	12,526	4,486	1,511	982	13
Paper birch	570,922	186,324	140,402	111,967	74,208	36,524	13,923	4,942	1,669	646	180	132	5
River birch	185	108	60	12	--	--	--	--	--	5	--	--	--
Black cherry	35,436	27,358	3,977	1,837	1,328	513	226	121	49	19	7	1	--
Black walnut	2,286	729	437	96	448	160	136	105	93	50	19	13	--
Butternut	2,946	736	616	202	518	295	235	126	106	73	17	19	3
Other hardwoods	68,167	34,749	13,119	8,299	5,107	3,141	1,609	1,005	496	280	179	155	28
Noncommercial spp.	343,481	288,665	41,776	10,867	1,695	359	79	28	--	5	--	5	2
Total	5,288,041	2,835,642	972,512	596,453	378,117	240,003	133,377	67,885	33,337	15,685	7,162	7,053	815
All species	8,441,843	4,284,654	1,820,494	1,070,271	596,455	333,848	172,254	84,623	40,942	19,327	9,202	8,834	939

Table 11.--Number of growing-stock trees on timberland by species group and diameter class, Minnesota, 1990

(In thousand trees)

Species group	All classes	Diameter class (inches at breast height) 1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods													
Jack pine	156,774	43,834	30,947	31,879	25,094	15,013	6,434	2,590	708	203	47	25	--
Red pine	96,400	20,083	20,382	21,059	14,572	7,855	4,583	3,121	2,068	1,352	763	561	1
White pine	25,930	7,326	4,983	3,941	2,585	1,928	1,460	1,123	721	568	467	716	112
White spruce	77,495	28,691	17,850	12,753	7,786	4,358	2,861	1,433	863	495	254	151	--
Black spruce	1,022,264	508,581	321,611	141,162	39,995	8,831	1,674	262	102	22	11	12	1
Balsam fir	953,850	521,972	234,835	116,774	50,915	20,299	6,836	1,648	429	93	30	19	--
Tamarack	350,608	158,656	97,539	58,697	23,814	8,109	2,591	840	274	39	37	12	--
Eastern redcedar	12,760	6,980	3,131	1,256	1,013	199	135	23	13	7	--	3	--
Northern white-cedar	334,576	125,689	78,316	60,063	37,249	18,709	8,100	3,823	1,612	591	268	155	1
Other softwoods	1,634	351	575	300	291	71	18	20	8	--	--	--	--
Total	3,032,291	1,422,163	810,169	447,884	203,314	85,372	34,692	14,883	6,798	3,370	1,877	1,654	115
Hardwoods													
Select white oak	176,496	65,987	37,980	28,962	16,452	10,985	6,685	3,975	2,506	1,466	710	741	47
Select red oak	100,388	26,688	10,891	11,730	15,225	14,073	8,934	5,421	3,431	1,930	1,015	980	70
Other red oak	5,300	1,464	672	762	1,115	335	340	203	179	74	66	85	5
Hickory	16,320	9,392	3,266	1,538	1,023	525	315	175	52	25	5	4	--
Basswood	176,542	76,522	31,583	24,183	16,864	12,378	6,729	3,918	2,057	1,212	548	516	32
Yellow birch	9,543	5,731	1,733	839	414	258	158	182	91	54	46	36	1
Hard maple	248,742	138,760	51,247	33,508	13,111	5,439	3,084	1,618	1,027	530	226	185	7
Soft maple	260,330	128,118	69,289	40,566	13,608	5,200	1,674	816	403	226	164	202	64
Elm	159,088	87,646	35,941	17,916	7,748	4,437	2,520	1,126	768	404	261	284	37
Black ash	497,620	268,596	112,616	59,545	32,234	14,510	6,192	2,523	898	329	112	65	--
White and green ash	81,551	47,222	13,868	7,616	5,173	3,490	1,941	1,105	576	271	161	107	21
Cottonwood	2,631	663	376	193	275	296	169	109	119	84	94	166	87
Willow	4,294	2,190	93	225	482	483	327	203	127	95	33	32	4
Hackberry	13,350	9,931	2,036	779	280	126	71	56	26	28	10	6	1
Balsam poplar	254,930	136,649	44,071	28,769	20,500	13,386	6,622	2,972	1,213	515	149	82	2
Bigtooth aspen	69,060	38,115	7,263	5,600	5,706	5,384	3,953	1,883	769	285	73	28	1
Quaking aspen	1,900,116	1,205,275	278,120	143,935	107,954	80,363	47,657	22,995	9,422	2,979	939	473	4
Paper birch	527,199	178,191	127,580	102,206	67,737	33,246	12,179	4,170	1,259	458	97	73	3
River birch	180	108	60	12	--	--	--	--	--	--	--	--	--
Black cherry	31,856	26,469	3,290	947	609	277	144	69	28	19	4	--	--
Black walnut	2,052	702	371	73	448	114	110	92	77	45	9	11	--
Butternut	2,022	736	511	31	276	182	136	60	44	26	14	6	--
Other hardwoods	49,718	32,861	8,092	4,164	2,218	1,414	446	276	146	61	28	11	1
Total	4,589,328	2,488,016	840,949	514,099	329,452	206,901	110,386	53,947	25,218	11,116	4,764	4,093	387
All species	7,621,619	3,910,179	1,651,118	961,983	532,766	292,273	145,078	68,830	32,016	14,486	6,641	5,747	502

Table 12.--Net volume of timber on timberland by class of timber and major species group, Minnesota, 1990

(In thousand cubic feet)

Class of timber	All species	Species group			
		Pine	Other softwoods	Soft hardwoods	Hard hardwoods
Live trees					
Growing-stock trees					
Sawtimber					
Saw log portion	5,653,286	906,955	1,151,359	2,473,352	1,121,620
Upper stem portion	1,677,381	118,338	174,467	960,818	423,758
Total	7,330,667	1,025,293	1,325,826	3,434,170	1,545,378
Poletimber	7,763,308	371,852	1,911,072	4,124,236	1,356,148
All growing-stock trees	15,093,975	1,397,145	3,236,898	7,558,406	2,901,526
Cull trees					
Short-log trees	301,777	7,553	24,216	128,000	142,008
Rough trees					
Sawtimber	579,670	15,653	50,370	243,927	269,720
Poletimber	629,085	10,301	71,018	336,677	211,089
Total	1,208,755	25,954	121,388	580,604	480,809
Rotten trees					
Sawtimber	310,869	3,495	42,699	195,296	69,379
Poletimber	98,469	550	18,308	64,769	14,842
Total	409,338	4,045	61,007	260,065	84,221
All cull trees	1,919,870	37,552	206,611	968,669	707,038
All live trees	17,013,845	1,434,697	3,443,509	8,527,075	3,608,564
Salvable dead trees					
Sawtimber	150,011	8,400	23,343	107,315	10,953
Poletimber	113,324	3,362	22,387	77,385	10,190
Total	263,335	11,762	45,730	184,700	21,143
All classes	17,277,180	1,446,459	3,489,239	8,711,775	3,629,707

Table 13.--Net volume of growing stock on timberland by species group and diameter class, Minnesota, 1990

(In thousand cubic feet)

Species group	All classes	Diameter class (inches at breast height) 5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods											
Jack pine	550,139	75,212	134,103	144,767	99,748	60,005	23,191	8,693	2,525	1,895	--
Red pine	581,621	56,356	81,547	79,009	74,380	74,467	69,101	59,321	43,512	43,825	103
White pine	261,642	8,780	13,742	18,323	23,051	26,746	24,203	26,031	28,066	72,041	20,659
White spruce	295,108	33,440	46,737	47,735	49,652	36,578	30,778	22,927	15,091	12,170	--
Black spruce	745,825	377,589	233,888	93,419	27,941	6,564	3,675	989	598	1,070	92
Balsam fir	961,739	292,768	290,250	207,787	110,458	39,290	14,176	4,082	1,704	1,224	--
Tamarack	475,035	164,225	147,114	87,141	43,215	19,850	8,988	1,677	1,958	867	--
Eastern redcedar	14,956	3,479	5,717	1,989	2,236	607	418	302	--	208	--
Northern white-cedar	744,235	133,811	182,054	161,522	107,935	74,796	41,990	20,680	11,814	9,563	70
Other softwoods	3,743	681	1,431	680	277	439	235	--	--	--	--
Total	4,634,043	1,146,341	1,136,583	842,372	538,893	339,342	216,755	144,702	105,268	142,863	20,924
Hardwoods											
Select white oak	645,287	63,030	84,818	99,718	94,962	82,394	71,567	54,709	33,879	53,156	7,054
Select red oak	816,814	28,607	81,178	133,957	134,678	119,217	103,546	78,105	52,431	74,756	10,339
Other red oak	36,745	1,866	5,408	3,127	4,787	4,255	4,951	2,692	3,180	5,794	685
Hickory	26,161	3,607	5,356	4,954	4,977	3,934	1,800	1,048	245	240	--
Basswood	691,130	65,188	101,823	133,234	109,802	92,879	66,483	50,419	28,650	38,389	4,263
Yellow birch	21,843	2,024	2,304	2,593	2,486	3,845	2,458	2,006	2,011	2,041	75
Hard maple	402,997	89,278	79,221	58,037	52,045	39,340	33,816	23,331	12,869	13,991	1,069
Soft maple	344,111	102,228	79,128	53,992	28,208	20,053	13,258	10,106	8,879	17,062	11,197
Elm	268,083	39,443	42,249	42,950	38,671	25,309	23,408	16,064	13,133	21,314	5,542
Black ash	699,328	152,954	186,691	148,891	99,676	58,937	28,553	13,510	5,743	4,373	--
White and green ash	186,502	18,235	29,076	34,467	29,913	25,455	18,028	11,090	8,720	8,570	2,948
Cottonwood	52,385	452	1,291	2,775	2,740	2,437	3,768	3,460	4,738	13,538	17,186
Willow	29,374	493	2,495	4,476	4,821	4,461	3,795	3,708	1,683	2,686	756
Hackberry	9,885	1,898	1,456	1,180	1,030	1,341	770	1,099	498	456	157
Balsam poplar	594,094	76,421	120,009	140,550	108,167	71,257	40,273	22,111	8,176	6,838	292
Bigtooth aspen	278,351	16,502	37,040	61,137	69,418	47,748	27,006	13,066	4,274	2,038	122
Quaking aspen	3,809,323	383,265	652,746	869,579	802,446	562,848	315,970	132,581	52,813	36,427	648
Paper birch	1,454,841	293,544	422,954	360,091	206,195	100,563	41,127	19,371	5,218	5,288	490
River birch	37	37	--	--	--	--	--	--	--	--	--
Black cherry	15,684	2,771	3,784	3,053	2,461	1,729	925	777	184	--	--
Black walnut	14,163	172	2,868	1,354	2,005	2,255	2,469	1,789	503	748	--
Butternut	11,145	119	1,828	2,092	2,268	1,403	1,315	949	738	433	--
Other hardwoods	51,649	8,749	11,416	12,155	5,954	5,457	3,885	2,190	1,157	584	102
Total	10,459,932	1,350,883	1,955,139	2,174,362	1,807,710	1,277,117	809,171	464,181	249,722	308,722	62,925
All species	15,093,975	2,497,224	3,091,722	3,016,734	2,346,603	1,616,459	1,025,926	608,883	354,990	451,585	83,849

Table 14.--Net volume of growing stock in the saw-log portion of sawtimber trees on timberland by species group and diameter class, Minnesota, 1990

(In thousand cubic feet)

Species group	All classes	Diameter class (inches at breast height) 9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods									
Jack pine	291,024	117,957	87,015	53,417	20,804	7,834	2,280	1,717	--
Red pine	407,896	69,540	68,664	69,364	64,325	55,093	40,320	40,495	95
White pine	206,637	14,194	19,385	23,033	21,049	22,739	24,578	63,328	18,331
White spruce	194,445	41,011	45,022	33,635	28,401	21,178	13,939	11,259	--
Black spruce	123,700	84,885	26,488	6,248	3,485	938	565	1,004	87
Balsam fir	318,020	168,293	95,901	34,869	12,663	3,659	1,532	1,103	--
Tamarack	143,719	74,152	38,975	18,184	8,259	1,543	1,805	801	--
Eastern redcedar	4,982	1,617	1,970	547	380	276	--	192	--
Northern white-cedar	366,493	131,019	93,628	66,347	37,584	18,578	10,636	8,637	64
Other softwoods	1,398	550	244	392	212	--	--	--	--
Total	2,058,314	703,218	477,292	306,036	197,162	131,838	95,655	128,536	18,577
Hardwoods									
Select white oak	287,127	--	61,005	58,768	53,160	41,492	25,960	41,198	5,544
Select red oak	416,059	--	86,796	85,414	77,373	59,521	40,414	58,337	8,204
Other red oak	19,463	--	3,058	3,064	3,720	2,060	2,458	4,558	545
Hickory	7,948	--	2,932	2,619	1,271	763	181	182	--
Basswood	288,845	--	73,759	68,698	50,947	39,213	22,489	30,321	3,418
Yellow birch	11,516	--	1,719	2,890	1,930	1,613	1,625	1,677	62
Hard maple	127,291	--	33,759	28,356	25,434	17,896	9,978	11,004	864
Soft maple	78,436	--	17,862	14,226	9,801	7,628	6,783	13,253	8,883
Elm	99,764	--	23,481	17,371	16,839	11,812	9,794	16,169	4,298
Black ash	153,720	--	68,305	44,407	22,247	10,702	4,559	3,500	--
White and green ash	76,893	--	20,073	18,732	13,726	8,550	6,777	6,701	2,334
Cottonwood	35,756	--	1,603	1,585	2,650	2,506	3,503	10,291	13,618
Willow	14,934	--	2,772	2,941	2,656	2,674	1,241	2,054	596
Hackberry	3,779	--	617	935	560	822	376	347	122
Balsam poplar	184,220	--	72,475	52,331	30,538	17,010	6,313	5,325	228
Bigtooth aspen	119,906	--	47,857	35,834	20,896	10,240	3,365	1,616	98
Quaking aspen	1,380,411	--	546,314	418,339	242,230	103,016	41,327	28,674	511
Paper birch	257,755	--	132,936	71,476	30,418	14,552	3,957	4,036	380
Black cherry	4,259	--	1,564	1,252	698	601	144	--	--
Black walnut	7,452	--	1,401	1,701	1,933	1,418	399	600	--
Butternut	5,287	--	1,524	1,045	1,030	753	586	349	--
Other hardwoods	14,151	--	3,983	4,036	2,972	1,703	913	463	81
Total	3,594,972	--	1,205,795	936,020	613,029	356,545	193,142	240,655	49,786
All species	5,653,286	703,218	1,683,087	1,242,056	810,191	488,383	288,797	369,191	68,363

Table 15.--Net volume of sawtimber on timberland by species group and diameter class, Minnesota, 1990

(In thousand board feet) [1]

Species group	All classes	Diameter class (inches at breast height) 9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods									
Jack pine	1,698,838	697,883	495,701	308,811	123,536	47,692	14,213	11,002	--
Red pine	2,429,466	403,407	388,395	401,461	383,473	337,572	252,911	261,608	639
White pine	1,287,412	85,250	110,685	133,367	125,317	139,255	153,976	414,340	125,222
White spruce	1,147,695	239,874	255,574	194,535	169,051	129,297	87,023	72,341	--
Black spruce	709,109	486,690	149,271	36,073	20,754	5,716	3,517	6,513	575
Balsam fir	1,854,099	993,073	545,260	201,660	75,221	22,366	9,537	6,982	--
Tamarack	833,890	432,591	221,374	105,142	49,044	9,394	11,218	5,127	--
Eastern redcedar	29,531	9,890	11,319	3,173	2,247	1,673	--	1,229	--
Northern white-cedar	2,191,719	806,886	543,456	385,622	222,536	112,300	65,621	54,877	421
Other softwoods	8,140	3,241	1,386	2,256	1,257	--	--	--	--
Total	12,189,899	4,158,785	2,722,421	1,772,100	1,172,436	805,265	598,016	834,019	126,857
Hardwoods									
Select white oak	1,819,363	--	392,750	365,348	330,440	260,370	165,014	268,024	37,417
Select red oak	2,632,750	--	555,635	529,703	480,753	373,951	257,300	380,067	55,341
Other red oak	123,672	--	19,787	19,038	23,126	12,894	15,618	29,553	3,656
Hickory	50,375	--	19,031	16,338	7,896	4,785	1,151	1,174	--
Basswood	1,820,693	--	468,876	425,052	316,561	246,542	143,112	197,555	22,995
Yellow birch	72,693	--	11,029	18,007	11,998	10,100	10,313	10,834	412
Hard maple	803,435	--	216,011	175,752	158,012	112,571	63,609	71,621	5,859
Soft maple	502,432	--	114,648	88,285	60,911	47,945	43,194	86,717	60,732
Elm	635,878	--	152,219	108,095	104,728	74,129	62,248	105,213	29,246
Black ash	966,959	--	434,859	274,919	138,215	67,222	29,053	22,691	--
White and green ash	484,770	--	127,251	115,761	85,300	53,752	43,208	43,739	15,759
Cottonwood	235,374	--	10,308	9,868	16,501	15,739	22,277	67,273	93,408
Willow	95,126	--	18,090	18,330	16,519	16,796	7,881	13,450	4,060
Hackberry	23,940	--	4,051	5,802	3,476	5,159	2,392	2,238	822
Balsam poplar	1,155,227	--	458,827	323,337	189,724	106,881	40,265	34,644	1,549
Bigtooth aspen	748,265	--	300,474	220,925	129,788	64,435	21,487	10,492	664
Quaking aspen	8,631,429	--	3,444,138	2,581,517	1,503,916	648,182	263,737	186,479	3,460
Paper birch	1,622,177	--	845,591	442,472	188,846	91,345	25,181	26,191	2,551
Black cherry	26,808	--	10,044	7,751	4,331	3,769	913	--	--
Black walnut	46,779	--	8,847	10,530	12,028	8,897	2,551	3,926	--
Butternut	33,328	--	9,726	6,470	6,397	4,722	3,730	2,283	--
Other hardwoods	89,095	--	25,538	25,070	18,466	10,706	5,793	2,981	541
Total	22,620,568	--	7,647,730	5,788,370	3,807,932	2,240,892	1,230,027	1,567,145	338,472
All species	34,810,467	4,158,785	10,370,151	7,560,470	4,980,368	3,046,157	1,828,043	2,401,164	465,329

[1] International 1/4-inch rule.

Table 16.--Net volume of growing stock and sawtimber on timberland by county and major species group, Minnesota, 1990

Unit and county	Growing stock					Sawtimber				
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	Thousand cubic feet					*Thousand board feet*[1]				
Aspen-Birch Unit										
Carlton	314,830	19,392	62,883	170,623	61,932	588,848	94,935	139,964	275,904	78,045
Cook	696,223	43,733	297,754	308,185	46,551	1,660,290	182,142	795,466	585,628	97,054
Koochiching	1,254,527	47,967	615,923	493,726	96,911	2,334,281	170,007	1,118,523	900,814	144,937
Lake	840,318	97,996	295,841	376,658	69,823	1,855,088	364,487	734,806	637,737	118,058
St. Louis	2,506,001	266,650	773,545	1,320,127	145,679	5,451,391	1,200,007	1,522,402	2,552,104	176,878
Total	5,611,899	475,738	2,045,946	2,669,319	420,896	11,889,898	2,011,578	4,311,161	4,952,187	614,972
Northern Pine Unit										
Aitkin	765,335	21,964	133,468	397,526	212,377	1,694,754	75,111	254,160	914,516	450,967
Becker	421,020	36,279	31,461	243,590	109,690	994,058	142,675	71,331	519,696	260,356
Beltrami	914,207	90,406	204,533	517,843	101,425	2,021,420	373,992	398,224	1,086,184	163,020
Cass	1,061,693	177,804	118,681	577,330	187,878	2,601,353	703,818	267,958	1,272,073	357,504
Clearwater	348,653	30,131	36,311	231,750	50,461	769,464	119,873	101,574	443,948	104,069
Crow Wing	475,196	72,762	23,463	232,577	146,394	1,085,855	244,374	48,951	474,004	318,526
Hubbard	454,071	115,373	33,029	237,292	68,377	969,317	352,669	99,901	397,108	119,639
Itasca	1,446,545	198,079	353,785	740,915	153,766	3,607,784	850,389	761,293	1,733,620	262,482
Lake of the Woods	306,546	29,676	127,809	137,739	11,322	552,138	98,109	192,130	244,281	17,618
Mahnomen	137,400	1,692	1,202	94,755	39,751	259,391	7,577	3,094	186,179	62,541
Roseau	160,584	22,160	42,280	84,952	11,192	328,271	81,217	86,848	145,559	14,647
Wadena	94,522	38,975	3,058	30,853	21,636	200,976	94,488	3,511	47,058	55,919
Total	6,585,772	835,301	1,109,080	3,527,122	1,114,269	15,084,781	3,144,292	2,288,975	7,464,226	2,187,288
Central Hardwood Unit										
Anoka-Dakota-Ramsey Washington	62,436	849	233	19,924	41,430	187,186	1,091	219	45,636	140,240
Benton-Sherburne	71,622	10,706	285	12,367	48,264	178,946	24,175	801	23,052	130,918
Carver-Hennepin-Scott	46,493	--	441	14,569	31,483	168,951	--	941	51,238	116,772
Chisago-Isanti	89,426	13,873	2,832	29,318	43,403	211,040	11,134	4,072	54,478	141,356
Douglas-Todd	129,016	1,440	4,912	51,566	71,098	382,643	5,955	16,120	132,439	228,129
Fillmore-Olmsted	163,447	1,026	2,212	39,923	120,286	548,129	5,594	5,017	111,407	426,111
Goodhue	93,782	1,108	809	41,280	50,585	328,041	4,942	2,450	125,498	195,151
Houston	153,188	1,517	1,931	50,082	99,658	512,930	7,412	2,738	153,105	349,675
Kanabec	132,279	1,873	5,234	71,276	53,896	292,810	8,843	5,587	136,653	141,727
LeSueur-Rice	49,396	--	698	25,472	23,226	181,223	--	718	94,402	86,103
Mille Lacs	144,213	491	2,109	78,027	63,586	300,113	--	3,084	160,424	136,605
Morrison	197,856	18,729	4,873	100,603	73,651	428,059	65,200	8,405	157,738	196,716
Otter Tail	200,404	2,438	11,198	88,553	98,215	529,431	6,231	34,091	230,999	258,110
Pine	462,896	29,004	30,192	303,767	99,933	874,867	112,026	55,781	513,208	193,852
Stearns	61,795	--	2,770	29,890	29,135	175,087	--	5,859	83,425	85,803
Wabasha	74,695	136	--	29,996	44,563	237,818	666	--	77,715	159,437
Winona	157,509	1,272	747	44,250	111,240	537,186	6,583	2,336	119,474	408,793
Wright	40,477	--	1,174	19,857	19,446	142,601	--	1,617	65,392	75,592
Total	2,330,930	84,462	72,650	1,050,720	1,123,098	6,217,061	259,852	149,836	2,336,283	3,471,090

(Table 16 continued on next page)

(Table 16 continued)

Unit and county	Growing stock					Sawtimber				
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	Thousand cubic feet					*Thousand board feet*[1]				
Prairie Unit										
Blue Earth-Faribault	42,484	--	2,029	27,395	13,060	160,458	--	4,412	105,826	50,220
Clay-Norman	50,490	--	--	17,881	32,609	145,407	--	--	44,036	101,371
Eastern Group[2]	50,645	--	102	12,318	38,225	203,447	--	515	42,863	160,069
Kandiyohi-Meeker	43,605	--	272	21,213	22,120	168,224	--	--	83,057	85,167
Kittson	42,598	--	--	28,674	13,924	51,737	--	--	19,784	31,953
Marshall	75,266	--	3,782	58,549	12,935	98,440	--	2,717	61,639	34,084
Northern Group[3]	60,018	--	200	36,525	23,293	229,625	--	544	134,590	94,491
Pennington-Red Lake	47,133	--	--	30,128	17,005	87,529	--	--	41,454	46,075
Polk	67,677	762	98	39,987	26,830	168,257	4,181	530	100,460	63,086
Southern Group[4]	37,678	--	2,327	18,368	16,983	143,659	--	5,192	73,912	64,555
Western Group[5]	47,780	882	412	20,207	26,279	161,944	3,953	2,161	70,360	85,470
Total	565,374	1644	9,222	311,245	243,263	1,618,727	8,134	16,071	777,981	816,541
All counties	15,093,975	1,397,145	3,326,898	7,558,406	2,901,526	34,810,467	5,423,856	6,766,043	15,530,677	7,089,891

[1]International 1/4-inch rule.

[2]Includes: Dodge, Freeborn, Mower, Steele, and Waseca Counties.

[3]Includes: McLeod, Nicollet, Renville, and Sibley Counties.

[4]Includes: Brown, Cottonwood, Jackson, Martin, Redwood, and Watonwan Counties.

[5]Includes: Big Stone, Chippewa, Grant, Lac Qui Parle, Lincoln, Lyon, Murray, Nobles, Pipestone, Pope, Rock, Stevens, Swift, Traverse, Wilkin, and Yellow Medicine Counties.

Table 17.--Net volume of live trees and growing stock on timberland by ownership class and major species group, Minnesota, 1990

(In thousand cubic feet)

Ownership class	Live trees					Growing-stock trees				
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
National forest	2,217,442	390,181	613,442	1,064,970	148,849	2,101,270	387,268	591,002	996,652	126,348
Bureau of Land Mgmt.	23,173	5,933	7,319	7,881	2,040	21,719	5,765	7,130	6,784	2,040
Miscellaneous federal	253,512	18,105	25,052	135,400	74,955	217,468	17,746	23,870	116,891	58,961
State	2,990,546	217,688	1,081,221	1,284,662	406,975	2,707,674	210,626	1,008,775	1,146,337	341,936
County and municipal	2,988,681	221,671	617,665	1,698,295	451,050	2,723,885	215,025	574,901	1,534,726	399,233
Indian	591,754	46,742	168,384	306,763	69,865	538,462	45,637	155,066	276,271	61,488
Forest industry	736,955	89,194	229,781	344,239	73,741	669,248	86,112	214,678	306,162	62,296
Farmer	2,801,258	94,281	150,944	1,281,458	1,274,575	2,248,762	90,615	140,684	1,061,051	956,412
Misc. private corporation	669,415	38,865	125,198	374,618	130,734	588,428	37,227	120,545	330,245	100,411
Misc. private individual	3,741,109	312,037	424,503	2,028,789	975,780	3,277,059	301,124	400,247	1,783,287	792,401
All owners	17,013,845	1,434,697	3,443,509	8,527,075	3,608,564	15,093,975	1,397,145	3,236,898	7,558,406	2,901,526

Table 18.--Net volume of sawtimber on timberland by species group and butt log grade, Minnesota, 1990

(In thousand board feet) [1]

Species group	All grades	Butt log grade			
		1	2	3	Tie and timber
Softwoods					
Jack pine	1,698,838	10,006	109,181	1,579,651	--
Red pine	2,429,466	240,332	439,226	1,748,983	925
White pine	1,287,412	224,000	393,413	552,933	117,066
White spruce	1,147,695	21,306	83,971	1,040,633	1,785
Black spruce	709,109	--	13,592	695,517	--
Balsam fir	1,854,099	--	22,066	1,832,033	--
Tamarack	833,890	--	45,664	785,683	2,543
Eastern redcedar	29,531	--	2,101	27,430	--
Northern white-cedar	2,191,719	15,375	164,099	2,006,237	6,008
Other softwoods	8,140	--	--	8,140	--
Total	12,189,899	511,019	1,273,313	10,277,240	128,327
Hardwoods					
Select white oak	1,819,363	83,239	281,256	802,781	652,087
Select red oak	2,632,750	162,284	655,755	1,260,949	553,762
Other red oak	123,672	7,443	17,320	34,044	64,865
Hickory	50,375	1,757	7,987	26,416	14,215
Basswood	1,820,693	431,604	563,864	782,411	42,814
Yellow birch	72,693	15,147	12,498	36,638	8,410
Hard maple	803,435	90,782	227,713	394,039	90,901
Soft maple	502,432	40,032	65,259	289,315	107,826
Elm	635,878	51,358	170,347	304,176	109,997
Black ash	966,959	79,204	246,987	583,380	57,388
White & green ash	484,770	86,771	105,078	215,102	77,819
Cottonwood	235,374	70,982	66,857	75,177	22,358
Willow	95,126	--	6,283	14,863	73,980
Hackberry	23,940	--	2,639	18,776	2,525
Balsam poplar	1,155,227	59,769	169,249	830,971	95,238
Bigtooth aspen	748,265	22,678	164,892	482,824	77,871
Quaking aspen	8,631,429	324,571	1,342,665	6,214,686	749,507
Paper birch	1,622,177	69,879	298,959	1,119,355	133,984
Black cherry	26,808	--	3,138	18,573	5,097
Black walnut	46,779	--	24,265	18,445	4,069
Butternut	33,328	13,402	--	10,158	9,768
Other hardwoods	89,095	--	4,287	44,138	40,670
Total	22,620,568	1,610,902	4,437,298	13,577,217	2,995,151
All species	34,810,467	2,121,921	5,710,611	23,854,457	3,123,478

[1] International 1/4-inch rule.

Table 19.--Average net annual growth of growing stock and sawtimber on timberland by county and major species group, Minnesota, 1977-1989

Unit and county	Growing stock					Sawtimber				
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	Thousand cubic feet					*Thousand board feet*[1]				
Aspen-Birch Unit										
Carlton	9,258	578	1,757	5,132	1,791	24,575	3,366	5,584	12,460	3,165
Cook	11,845	1,402	3,662	5,592	1,189	44,716	6,030	18,046	18,515	2,125
Koochiching	32,438	1,729	13,662	14,565	2,482	90,630	6,950	37,857	40,206	5,617
Lake	18,532	2,847	5,691	8,037	1,957	65,749	10,683	25,003	26,281	3,782
St. Louis	60,347	6,380	18,114	31,387	4,466	221,591	34,094	63,848	115,802	7,847
Total	132,420	12,936	42,886	64,713	11,885	447,261	61,123	150,338	213,264	22,536
Northern Pine Unit										
Aitkin	21,515	1,140	3,705	10,666	6,004	66,475	4,277	10,430	35,339	16,429
Becker	8,090	701	498	3,907	2,984	33,531	4,051	1,605	18,304	9,571
Beltrami	22,124	2,738	3,601	12,834	2,951	78,133	13,590	14,323	43,995	6,225
Cass	26,479	5,518	1,807	13,792	5,362	104,264	24,261	10,319	54,748	14,936
Clearwater	9,420	914	890	6,079	1,537	32,375	4,050	3,579	20,922	3,824
Crow Wing	14,048	2,179	577	7,021	4,271	52,903	10,090	1,881	26,439	14,493
Hubbard	14,262	4,189	758	7,225	2,090	45,570	16,510	2,427	22,344	4,289
Itasca	33,510	5,972	7,393	16,269	3,876	136,752	27,148	28,300	72,433	8,871
Lake of the Woods	8,722	647	3,482	4,157	436	23,478	3,067	8,490	11,274	647
Mahnomen	2,915	78	35	1,740	1,062	10,004	694	66	6,600	2,644
Roseau	5,169	660	1,043	3,082	384	11,795	2,227	3,054	5,994	520
Wadena	4,121	2,232	130	1,131	628	11,092	5,295	278	2,850	2,669
Total	170,375	26,968	23,919	87,903	31,585	606,372	115,260	84,752	321,242	85,118
Central Hardwood Unit										
Anoka-Dakota-Ramsey-Washington	2,214	-3	21	924	1,272	6,589	111	30	1,467	4,981
Benton-Sherburne	2,408	646	8	676	1,078	9,588	2,184	77	1,875	5,452
Carver-Hennepin-Scott	1,214	--	33	603	578	5,337	--	47	1,786	3,504
Chisago-Isanti	2,452	912	32	667	841	6,100	1,185	-128	868	4,175
Douglas-Todd	1,222	-8	92	-267	1,405	9,239	60	682	1,436	7,061
Fillmore-Olmsted	2,982	36	150	731	2,065	14,389	209	207	2,611	11,362
Goodhue	995	33	39	43	880	7,794	318	97	1,870	5,509
Houston	3,112	73	49	864	2126	15,833	414	255	3,960	11,204
Kanabec	4,049	41	188	2,263	1,557	13,675	201	331	7,180	5,963
LeSueur-Rice	1,149	--	39	382	728	3,088	--	34	879	2,175
Mille Lacs	3,887	40	87	2,034	1,726	12,670	--	183	6,992	5,495
Morrison	6,091	698	165	3,419	1,809	22,692	4,485	333	10,030	7,844
Otter Tail	2,978	106	67	733	2,072	16,529	643	1,127	5,580	9,179
Pine	13,517	1,071	820	8,739	2,887	44,557	3,437	3,204	28,678	9,238
Stearns	493	--	17	-154	630	3,484	--	264	499	2,721
Wabasha	1,280	13	--	376	891	6,942	65	--	1,476	5,401
Winona	2,795	43	19	383	2,350	14,091	290	92	1,935	11,774
Wright	599	--	-12	93	518	2,572	--	-47	438	2,181
Total	53,437	3,701	1,814	22,509	25,413	215,169	13,602	6,788	79,560	115,219

(Table 19 continued on next page)

(Table 19 continued)

Unit and county	Growing stock					Sawtimber				
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	Thousand cubic feet					*Thousand board feet*[1]				
Prairie Unit										
Blue Earth-Faribault	934	--	133	513	288	3,086	--	275	1,428	1,383
Clay-Norman	561	--	--	57	504	3,897	--	--	929	2,968
Eastern Group[2]	818	--	8	148	662	4,728	--	43	917	3,768
Kandiyohi-Meeker	809	--	19	293	497	4,197	--	--	2,034	2,163
Kittson	1,036	--	--	707	329	1,206	--	--	-52	1,258
Marshall	2,403	--	181	1,824	398	4,041	--	103	3,051	887
Northern Group[3]	790	--	13	263	514	3,878	--	37	855	2,986
Pennington-Red Lake	1,190	--	--	782	408	4,155	--	--	2,365	1,790
Polk	1,469	5	-6	905	565	5,691	52	-35	3,253	2,421
Southern Group[4]	696	--	62	120	514	1,886	--	203	-64	1,747
Western Group[5]	1,031	46	16	274	695	4,829	222	91	1,195	3,321
Total	11,737	51	426	5,886	5,374	41,594	274	717	15,911	24,692
All counties	367,969	43,656	69,045	181,011	74,257	1,310,396	190,259	242,595	629,977	247,565

[1]International 1/4-inch rule.

[2]Includes: Dodge, Freeborn, Mower, Steele, and Waseca Counties.

[3]Includes: McLeod, Nicollet, Renville, and Sibley Counties.

[4]Includes: Brown, Cottonwood, Jackson, Martin, Redwood, and Watonwan Counties.

[5]Includes: Big Stone, Chippewa, Grant, Lac Qui Parle, Lincoln, Lyon, Murray, Nobles, Pipestone, Pope, Rock, Stevens, Swift, Traverse, Wilkin, and Yellow Medicine Counties.

Table 20.--Average annual removals of growing stock and sawtimber on timberland by county and species group, Minnesota, 1977-1989

Unit and county	Growing stock					Sawtimber				
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	Thousand cubic feet					*Thousand board feet*[1]				
Aspen-Birch Unit										
Carlton	3,658	185	531	2,359	583	5,991	878	1,185	3,370	558
Cook	9,280	3,026	3,356	2,831	67	26,644	13,373	5,944	7,327	--
Koochiching	25,122	2,100	8,429	13,920	673	53,652	6,647	18,710	26,992	1,303
Lake	10,881	370	3,306	6,916	289	20,546	1,825	5,484	12,921	316
St. Louis	33,416	4,047	6,839	21,241	1,289	72,348	19,032	13,014	38,832	1,470
Total	82,357	9,728	22,461	47,267	2,901	179,181	41,755	44,337	89,442	3,647
Northern Pine Unit										
Aitkin	6,774	101	691	4,975	1,007	19,126	418	1,689	14,037	2,982
Becker	3,026	662	149	1,691	524	8,026	2,830	506	3,343	1,347
Beltrami	14,202	3,362	1,948	8,479	413	37,854	13,266	4,078	19,978	532
Cass	15,224	2,091	1,446	10,317	1,370	33,265	7,509	3,873	19,335	2,548
Clearwater	3,763	406	346	2,869	142	8,446	2,010	1,105	4,776	555
Crow Wing	6,536	1,035	9	3,742	1,750	15,457	3,525	46	8,910	2,976
Hubbard	7,224	1,554	287	5,084	299	14,741	6,647	468	7,122	504
Itasca	28,565	1,369	4,927	20,683	1,586	69,465	6,426	13,364	47,793	1,882
Lake of the Woods	2,090	599	80	1,411	--	5,493	1,537	230	3,726	--
Mahnomen	1,117	98	24	673	322	2,592	390	132	1,238	832
Roseau	833	401	83	209	140	2,284	1,836	315	133	--
Wadena	1,396	516	53	712	115	3,630	1,778	248	1,465	139
Total	90,750	12,194	10,043	60,845	7,668	220,379	48,172	26,054	131,856	14,297
Central Hardwood Unit										
Anoka-Dakota-Ramsey-Washington	287	--	--	39	248	671	--	--	119	552
Benton-Sherburne	736	53	--	261	422	2,371	--	--	986	1,385
Carver-Hennepin-Scott	51	--	--	35	16	163	--	--	163	--
Chisago-Isanti	1,130	136	--	473	521	4,275	747	--	1,495	2,033
Douglas-Todd	888	39	14	645	190	2,944	102	73	2,220	549
Fillmore-Olmsted	1,868	--	--	575	1,293	8,737	--	--	2,559	6,178
Goodhue	1,796	--	--	1,031	765	7,016	--	--	3,914	3,102
Houston	1,779	--	--	123	1,656	8,118	--	--	444	7,674
Kanabec	2,018	--	--	1,408	610	4,849	--	--	2,875	1,974
LeSueur-Rice	443	--	--	363	80	1,101	--	--	698	403
Mille Lacs	1,329	--	--	898	431	2,923	--	--	1,805	1,118
Morrison	3,180	24	--	2,121	1,035	7,795	--	--	4,082	3,713
Otter Tail	3,607	--	--	2,027	1,580	10,157	--	--	5,692	4,465
Pine	5,486	130	75	4,045	1,236	13,390	408	261	8,193	4,528
Stearns	664	--	--	391	273	2,254	--	--	1,207	1,047
Wabasha	1,255	--	--	600	655	5,803	--	--	2,758	3,045
Winona	2,735	--	--	231	2,504	12,887	--	--	1,098	11,789
Wright	508	--	--	405	103	1,502	--	--	1,185	317
Total	29,760	382	89	15,671	13,618	96,956	1,257	334	41,493	53,872

(Table 20 continued on next page)

(Table 20 continued)

Unit and county	Growing stock					Sawtimber				
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	Thousand cubic feet					*Thousand board feet*[1]				
Prairie Unit										
Blue Earth-Faribault	143	--	--	95	48	555	--	--	353	202
Clay-Norman	1,136	--	--	471	665	3,530	--	--	1,485	2,045
Eastern Group[2]	595	--	--	159	436	2,322	--	--	591	1,731
Kandiyohi-Meeker	15	--	--	15	--	84	--	--	84	--
Kittson	159	--	--	151	8	49	--	--	49	--
Marshall	1,325	--	22	1,024	279	1,126	--	--	587	539
Northern Group[3]	486	--	--	288	198	2,065	--	--	1,111	954
Pennington-Red Lake	467	--	--	353	114	857	--	--	574	283
Polk	2,268	--	--	1,726	542	5,809	--	--	3,830	1,979
Southern Group[4]	120	--	--	77	43	394	--	--	256	138
Western Group[5]	481	--	--	195	286	2,043	--	--	699	1,344
Total	7,195	--	22	4,554	2,619	18,834	--	--	9,619	9,215
All counties	210,062	22,304	32,615	128,337	26,806	515,350	91,184	70,725	272,410	81,031

[1]International 1/4-inch rule.

[2]Includes: Dodge, Freeborn, Mower, Steele, and Waseca Counties.

[3]Includes: McLeod, Nicollet, Renville, and Sibley Counties.

[4]Includes: Brown, Cottonwood, Jackson, Martin, Redwood, and Watonwan Counties.

[5]Includes: Big Stone, Chippewa, Grant, Lac Qui Parle, Lincoln, Lyon, Murray, Nobles, Pipestone, Pope, Rock, Stevens, Swift, Traverse, Wilkin, and Yellow Medicine Counties.

Table 21.--Average net annual growth and average annual removals of growing stock on timberland by species group and Forest Survey Unit, Minnesota, 1977-1989

(In thousand cubic feet)

Species group	All Units		Aspen Birch Unit		Northern Pine Unit		Central Hardwoods Unit		Prairie Unit	
	Growth	Removals	Growth	Removals	Growth	Removals	Growth	Removals	Growth	Removals
Softwoods										
Jack pine	11,012	11,827	2,096	3,197	8,762	8,483	161	147	-7	--
Red pine	23,687	5,246	6,790	3,118	14,274	2,098	2,608	30	15	--
White pine	8,767	5,231	4,049	3,413	3,918	1,613	757	205	43	--
White spruce	12,800	4,681	9,277	3,458	3,326	1,186	180	31	17	6
Black spruce	11,515	9,651	8,759	8,946	2,572	705	148	--	36	--
Balsam fir	17,030	13,731	10,065	7,765	6,479	5,922	444	44	42	--
Tamarack	12,328	2,126	5,230	576	6,345	1,520	657	14	96	16
Eastern redcedar	649	--	15	--	14	--	385	--	235	--
Northern white-cedar	14,700	2,426	9,540	1,716	5,160	710	--	--	--	--
Other softwoods	213	--	1	--	37	--	175	--	--	--
Total	112,701	54,919	55,822	32,189	50,887	22,237	5,515	471	477	22
Hardwoods										
Select white oak	14,845	5,608	281	65	7,071	1,508	5,608	2,625	1,885	1,410
Select red oak	17,864	11,659	380	53	7,524	3,033	9,508	8,178	452	395
Other red oak	417	352	6	--	-14	88	430	255	-5	9
Hickory	879	51	--	--	15	--	785	47	79	4
Basswood	17,576	5,311	1,275	461	9,740	1,727	5,397	2,647	1,164	476
Yellow birch	104	32	124	--	-21	22	-10	10	11	--
Hard maple	12,365	2,950	4,369	692	5,655	943	2,213	1,243	128	72
Soft maple	14,995	1,777	4,775	503	5,984	682	4,056	577	180	15
Elm	-10,809	7,437	-1,822	722	-2,892	1,409	-4,489	4,356	-1,606	950
Black ash	18,585	4,396	6,373	1,971	9,456	2,017	2,558	352	198	56
White and green ash	6,916	1,382	323	120	1,773	57	2,877	736	1,943	469
Cottonwood	1,205	224	22	--	-4	--	482	52	705	172
Willow	506	259	14	--	42	9	172	210	278	40
Hackberry	406	8	--	--	--	--	209	--	197	8
Balsam poplar	9,292	8,227	3,330	3,914	4,631	3,536	437	206	894	571
Bigtooth aspen	8,359	3,985	1,277	1,204	4,839	1,825	2,208	956	35	--
Quaking aspen	114,996	81,855	44,727	29,837	54,687	44,037	11,659	5,738	3,923	2,243
Paper birch	23,388	18,913	11,082	10,626	10,852	7,593	1,462	654	-8	40
River birch	3	10	--	--	--	--	3	10	--	--
Black cherry	408	250	33	--	18	--	383	222	-26	28
Black walnut	465	74	--	--	--	--	403	67	62	7
Butternut	689	91	--	--	6	27	533	53	150	11
Other hardwoods	1,814	292	29	--	126	--	1,038	95	621	197
Total	255,268	155,143	76,598	50,168	119,488	68,513	47,922	29,289	11,260	7,173
All species	367,969	210,062	132,420	82,357	170,375	90,750	53,437	29,760	11,737	7,195

Table 22.--Average net annual growth and average annual removals of sawtimber on timberland by species group and Forest Survey Unit, Minnesota, 1977-1989

(In thousand board feet) [1]

Species group	All Units		Aspen Birch Units		Northern Pine Unit		Central Hardwoods Unit		Prairie Unit	
	Growth	Removals	Growth	Removals	Growth	Removals	Growth	Removals	Growth	Removals
Softwoods										
Jack pine	47,913	40,566	8,385	10,409	38,065	30,037	1,477	120	-14	--
Red pine	93,295	24,373	29,446	14,193	57,229	10,180	6,538	--	82	--
White pine	48,084	26,245	23,285	17,153	19,951	7,955	4,642	1,137	206	--
White spruce	52,033	21,668	37,841	15,812	13,673	5,743	428	113	91	--
Black spruce	24,474	11,222	19,654	10,642	4,743	580	77	--	--	--
Balsam fir	65,423	26,413	39,088	11,289	24,774	14,976	1,561	148	--	--
Tamarack	38,032	4,488	14,045	1,286	20,072	3,129	3,847	73	68	--
Eastern redcedar	1,433	--	--	--	--	--	875	--	558	--
Northern white-cedar	61,048	6,934	39,710	5,308	21,338	1,626	--	--	--	--
Other softwoods	1,119	--	7	--	167	--	945	--	--	--
Total	432,854	161,909	211,461	86,092	200,012	74,226	20,390	1,591	991	--
Hardwoods										
Select white oak	58,508	17,307	855	248	16,945	2,653	28,938	9,891	11,770	4,515
Select red oak	91,418	42,908	1,114	90	33,161	6,456	54,287	34,619	2,856	1,743
Other red oak	3,469	1,177	27	--	367	128	2,933	1,007	142	42
Hickory	2,181	163	--	--	6	--	1,992	163	183	--
Basswood	59,097	16,100	5,354	879	28,280	2,515	19,560	10,487	5,903	2,219
Yellow birch	1,034	--	853	--	179	--	2	--	--	--
Hard maple	25,107	7,177	5,343	313	11,058	1,657	7,576	4,965	1,130	242
Soft maple	21,470	1,908	4,330	285	6,776	621	8,986	918	1,378	84
Elm	-38,127	25,571	-5,172	2,501	-7,731	4,280	-16,349	15,460	-8,875	3,330
Black ash	39,105	7,127	13,326	2,954	18,676	3,361	6,749	778	354	34
White & green ash	22,714	4,304	1,008	42	4,419	42	10,224	2,023	7,063	2,197
Cottonwood	6,717	1,103	80	--	5	--	2,604	272	4,028	831
Willow	2,918	763	57	--	29	--	1,056	625	1,776	138
Hackberry	531	--	--	--	--	--	209	--	322	--
Balsam poplar	30,434	15,584	13,668	7,378	13,455	7,409	1,366	140	1,945	657
Bigtooth aspen	39,051	7,943	4,829	1,901	23,932	4,373	10,269	1,669	21	--
Quaking aspen	441,397	183,804	163,204	66,129	226,978	104,939	42,086	10,433	9,129	2,303
Paper birch	61,853	18,761	26,914	10,369	29,369	7,605	5,698	787	-128	--
Black cherry	1,506	447	--	--	--	--	1,302	447	204	--
Black walnut	1,685	322	--	--	--	--	1,457	322	228	--
Butternut	3,130	426	--	--	149	114	2,773	255	208	57
Other hardwoods	2,344	546	10	--	307	--	1,061	104	966	442
Total	877,542	353,441	235,800	93,089	406,360	146,153	194,779	95,365	40,603	18,834
All species	1,310,396	515,350	447,261	179,181	606,372	220,379	215,169	96,956	41,594	18,834

[1] International 1/4-inch rule.

Table 23.--Average net annual growth and average annual removals of growing stock on timberland by ownership class and major species group, Minnesota, 1977-1989

(In thousand cubic feet)

Ownership class	Growth					Removals				
		Species group					Species group			
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
National forest	49,936	11,573	11,713	23,070	3,580	36,371	4,923	7,963	22,503	982
Bureau of Land Mgmt.	413	86	207	58	62	189	180	--	9	--
Miscellaneous federal	4,470	477	597	2,017	1,379	1,156	203	283	606	64
State	63,539	6,277	19,729	28,951	8,582	33,016	4,828	8,551	18,041	1,596
County and municipal	66,234	6,356	11,553	36,607	11,718	37,866	3,720	4,799	26,768	2,579
Indian	11,814	1,306	2,801	5,986	1,721	3,543	1,347	688	1,366	142
Forest industry	18,871	3,787	4,700	8,889	1,495	18,664	1,639	4,041	11,721	1,263
Farmer	50,621	2,905	3,875	21,836	22,005	32,975	931	1,164	17,999	12,881
Miscellaneous private corporation	15,154	1,288	2,896	8,152	2,818	11,709	1,079	2,419	7,331	880
Miscellaneous private individual	86,917	9,601	10,974	45,445	20,897	34,573	3,454	2,707	21,993	6,419
All owners	367,969	43,656	69,045	181,011	74,257	210,062	22,304	32,615	128,337	26,806

Table 24.--Average net annual growth and average annual removals of sawtimber on timberland by ownership class and major species group, Minnesota, 1977-1989

(In thousand board feet)[1]

Ownership class	Growth					Removals				
		Species group					Species group			
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
National forest	205,487	54,645	53,154	89,101	8,587	83,545	21,883	17,082	43,739	841
Bureau of Land Mgmt.	2,243	881	534	688	140	641	641	--	--	--
Miscellaneous federal	20,182	2,396	1,646	10,402	5,738	3,430	1,001	470	1,656	303
State	202,679	25,846	56,743	93,931	26,159	79,074	19,165	19,776	37,374	2,759
County and municipal	233,424	28,373	41,182	135,238	28,631	87,346	15,184	10,679	55,854	5,629
Indian	41,323	6,073	9,412	22,298	3,540	9,684	6,176	1,112	2,005	391
Forest industry	59,181	12,140	16,135	27,729	3,177	38,205	4,998	8,298	23,103	1,806
Farmer	195,041	13,241	14,420	73,734	93,646	100,473	3,733	2,720	44,167	49,853
Miscellaneous private corporation	54,205	7,013	10,485	28,159	8,548	26,246	4,509	3,785	15,756	2,196
Miscellaneous private individual	296,631	39,651	38,884	148,697	69,399	86,706	13,894	6,803	48,756	17,253
All owners	1,310,396	190,259	242,595	629,977	247,565	515,350	91,184	70,725	272,410	81,031

[1] International 1/4-inch rule.

Table 25.--Average annual mortality of growing stock and sawtimber on timberland by species group, Minnesota, 1977-1989

Species group	Growing stock	Sawtimber
	Thousand cubic feet	*Thousand board feet* [1]
Softwoods		
Jack pine	10,308	33,830
Red pine	386	2,005
White pine	873	4,938
White spruce	2,048	8,540
Black spruce	14,076	15,740
Balsam fir	32,234	61,956
Tamarack	4,452	7,672
Eastern redcedar	30	52
Northern white-cedar	1,828	7,144
Total	66,235	141,877
Hardwoods		
White oak	993	3,358
Select red oak	6,990	18,422
Other red oak	480	1,254
Hickory	75	145
Basswood	3,091	8,875
Yellow birch	278	862
Hard maple	1,071	2,561
Soft maple	2,219	2,070
Elm	25,971	72,027
Black ash	3,787	6,073
White & green ash	510	932
Cottonwood	332	1,181
Willow	351	1,035
Hackberry	92	348
Balsam poplar	14,937	30,397
Bigtooth aspen	2,600	5,163
Quaking aspen	67,100	132,761
Paper birch	20,984	20,591
Black cherry	132	178
Black walnut	20	132
Butternut	104	138
Other hardwoods	876	1,350
Total	152,993	309,853
All species	219,228	451,730

[1] International 1/4-inch rule.

Table 26.--Area of land by land class and Forest Survey Unit, Minnesota, 1977 and 1990

(In thousand acres)

Land class	All Units		Aspen-Birch Unit		Northern Pine Unit		Central Hardwoods Unit		Prairie Unit	
	1977	1990	1977	1990	1977	1990	1977	1990	1977	1990
Forest land										
Timberland										
Jack pine	450.8	447.5	107.3	138.0	328.4	290.7	15.1	18.8	--	--
Red pine	243.8	301.6	95.9	121.0	133.8	167.0	14.1	12.5	--	1.1
White pine	68.3	63.2	43.0	33.3	21.6	24.3	3.7	4.6	--	1.0
Balsam fir	820.0	734.3	601.1	545.8	211.3	180.2	7.6	8.3	--	--
White spruce	62.9	93.8	45.7	66.2	17.2	27.4	--	0.2	--	--
Black spruce	1,037.0	1,322.1	739.0	943.2	280.2	348.2	17.8	28.7	--	2.0
Northern white-cedar	546.0	680.5	336.1	444.0	209.9	236.5	--	--	--	--
Tamarack	491.1	705.1	159.0	255.3	299.5	403.8	31.6	40.8	1.0	5.2
Oak-hickory	928.7	1,184.3	3.9	9.3	253.9	304.1	597.6	748.1	73.3	122.8
Elm-ash-soft maple	1,006.8	1,291.5	301.2	387.8	375.2	489.6	240.0	311.1	90.4	103.0
Maple-basswood	1,202.4	1,402.9	246.9	264.5	472.1	496.5	394.8	480.0	88.6	161.9
Aspen	5,158.2	5,114.2	1,880.1	1,991.1	2,493.3	2,379.1	538.0	532.1	246.8	211.9
Paper birch	991.2	835.8	548.4	458.2	367.1	321.2	75.7	56.4	--	--
Balsam poplar	547.6	427.7	192.4	156.6	307.5	229.5	13.8	13.7	33.9	27.9
Nonstocked	58.3	168.9	24.3	64.4	27.4	77.4	6.6	20.1	--	7.0
Subtotal	13,613.1	14,773.4	5,324.3	5,878.7	5,798.4	5,975.5	1,956.4	2,275.4	534.0	643.8
Reserved forest land	1,178.6	1,116.3	1,050.6	1,004.4	46.9	35.5	72.4	68.8	8.7	7.6
Other forest land	1,835.5	828.3	969.8	480.0	706.9	325.4	120.2	13.8	38.6	9.1
All forest land	16,627.2	16,718.0	7,344.7	7,372.2	6,552.2	6,336.4	2,149.0	2,358.0	581.3	660.5
Nonforest land										
Cropland	--	25,721.2	--	315.8	--	2,135.5	--	6,812.1	--	16,457.8
Pasture	--	1,291.3	--	64.8	--	409.6	--	474.1	--	342.8
Other	34,035.6	7,171.3	1,161.6	926.5	4,542.9	2,229.0	9,775.5	2,306.5	18,555.6	1,709.3
All nonforest land	34,035.6	34,183.8	1,161.6	1,307.1	4,542.9	4,774.1	9,775.5	9,592.7	18,555.6	18,509.9
Total land	50,662.8	50,901.9	8,506.3	8,679.3	11,095.1	11,110.5	11,924.5	11,950.7	19,136.9	19,170.4

Table 27.--Area of timberland by county, Minnesota, 1977 and 1990

(In thousand acres)

Unit and county	1977	1990
Aspen-Birch Unit		
Carlton	309.7	340.5
Cook	493.8	565.4
Koochiching	1,276.4	1,423.9
Lake	793.2	850.1
St. Louis	2,451.2	2,698.8
Total	5,324.3	5,878.7
Northern Pine Unit		
Aitkin	671.8	710.9
Becker	320.5	332.3
Beltrami	785.4	841.8
Cass	851.1	841.6
Clearwater	303.8	289.4
Crow Wing	371.2	386.7
Hubbard	429.4	399.8
Itasca	1,301.8	1,324.4
Lake of the Woods	357.7	398.4
Mahnomen	105.3	113.9
Roseau	194.1	217.2
Wadena	106.3	119.1
Total	5,798.4	5,975.5
Central Hardwood Unit		
Anoka-Dakota-Ramsey-Washington	17.0	70.4
Benton-Sherburne	49.3	85.4
Carver-Hennepin-Scott	27.8	44.9
Chisago-Isanti	79.6	102.7
Douglas-Todd	138.2	129.2
Fillmore-Olmstead	111.8	139.3
Goodhue	64.4	69.4
Houston	116.9	133.9
Kanabec	134.5	142.2
LeSueur-Rice	26.0	43.3
Mille Lacs	127.7	138.4
Morrison	169.3	166.4
Otter Tail	189.8	208.2
Pine	432.8	486.4
Stearns	65.4	69.2
Wabasha	59.8	67.9
Winona	116.9	127.7
Wright	29.2	50.5
Total	1,956.4	2,275.4
Prairie Unit		
Blue Earth-Faribault	31.5	46.5
Clay-Norman	36.6	48.4
Eastern Group	29.1	45.4
Kandiyohi-Meeker	7.6	42.0
Kittson	62.6	65.1
Marshall	138.7	133.3
Northern Group	32.4	53.0
Pennington-Red Lake	67.4	62.1
Polk	83.2	58.5
Southern Group	20.0	36.4
Western Group	24.9	53.1
Total	534.0	643.8
All counties	13,613.1	14,773.4

Table 28.--Area of timberland by stand-size class and Forest Survey Unit, Minnesota, 1977 and 1990

(In thousand acres)

Unit and stand-size class	1977	1990
All Units		
Sawtimber	3,484.4	4,895.3
Poletimber	6,930.5	5,260.6
Sapling-seedling	3,139.9	4,448.6
Nonstocked	58.3	168.9
Total	13,613.1	14,773.4
Aspen Birch Unit		
Sawtimber	1,075.2	1,502.3
Poletimber	2,705.2	2,168.7
Sapling-seedling	1,519.6	2,143.3
Nonstocked	24.3	64.4
Total	5,324.3	5,878.7
Northern Pine Unit		
Sawtimber	1,349.5	1,942.1
Poletimber	3,153.4	2,256.2
Sapling-seedling	1,268.1	1,699.8
Nonstocked	27.4	77.4
Total	5,798.4	5,975.5
Central Hardwoods Unit		
Sawtimber	862.6	1,138.3
Poletimber	861.7	686.2
Sapling-seedling	225.5	430.8
Nonstocked	6.6	20.1
Total	1,956.4	2,275.4
Prairie Unit		
Sawtimber	197.1	312.6
Poletimber	210.2	149.5
Sapling-seedling	126.7	174.7
Nonstocked	--	7.0
Total	534.0	643.8

Table 29.--Area of land by land-use class and Forest Survey Unit, Minnesota, 1990

(In thousand acres)

Land-use class	All Units	Forest Survey Unit			
		Aspen-Birch	Northern Pine	Central Hardwoods	Prairie
Forest land					
Timberland	14,773.4	5,878.7	5,975.5	2,275.4	643.8
Reserved forest land	1116.3	1004.4	35.5	68.8	7.6
Other forest land	828.3	480.0	325.4	13.8	9.1
Total	16,718.0	7,363.1	6,336.4	2,358.0	660.5
Nonforest land					
Nonforest with trees					
Cropland with trees	18.9	--	6.9	4.4	7.6
Improved pasture with trees	88.5	8.2	31.0	40.8	8.5
Wooded strips	101.0	9.1	20.5	38.6	32.8
Idle farmland with trees	32.9	7.6	16.3	4.0	5.0
Marsh with trees	219.2	39.7	108.1	53.8	17.6
Urban and other with trees	282.3	35.1	93.4	118.5	35.3
Windbreaks	105.9	1.2	6.5	29.3	68.9
Wooded pasture	101.1	4.8	20.8	55.1	20.4
Subtotal	949.8	105.7	303.5	344.5	196.1
Nonforest without trees					
Cropland	25,702.3	315.8	2,128.6	6,807.7	16,450.2
Improved pasture	1,101.7	51.8	357.8	378.2	313.9
Idle farmland	67.1	15.0	30.3	13.2	8.6
Marsh	3,120.0	393.6	1,506.6	720.7	499.1
Other farm-farmstead	582.9	18.6	41.0	237.1	286.2
Urban and other	2,332.8	338.1	306.6	1,003.6	684.5
Noncensus water	336.3	77.6	99.7	87.7	71.3
Subtotal	33,243.1	1,210.5	4,470.6	9,248.2	18,313.8
All nonforest land	34,192.9	1,316.2	4,774.1	9,592.7	18,509.9
Total land	50,910.9	8,679.3	11,110.5	11,950.7	19,170.4
Water	3,106.2	715.1	1,437.7	602.4	351.0
Total land and water	54,017.1	9,394.4	12,548.2	12,553.1	19,521.4

Table 30.--Area of timberland by ownership class, potential productivity class, and Forest Survey Unit, Minnesota, 1990

(In thousand acres)

Unit and ownership class	All classes	Potential productivity class (cubic feet of growth per acre per year)				
		165+	120-164	85-119	50-84	20-49
All Units						
National forest	1,821.1	1.5	21.8	296.7	441.2	1,059.9
Bureau of Land Mgmt.	26.1	--	--	1.3	6.5	18.3
Miscellaneous federal	171.6	--	2.6	17.9	52.8	98.3
State	3,077.9	4.1	13.8	357.2	584.0	2,118.8
County and municipal	2,505.6	--	22.7	413.4	669.5	1,400.0
Indian	490.6	--	4.1	67.6	94.5	324.4
Forest industry	751.3	--	7.7	158.6	186.6	398.4
Farmer	2,232.2	2.0	17.5	340.2	749.6	1,122.9
Misc. private corporation	613.0	--	2.0	88.2	187.0	335.8
Misc. private individual	3,084.0	1.6	29.8	589.6	928.6	1,534.4
All owners	14,773.4	9.2	122.0	2,330.7	3,900.3	8,411.2
Aspen-Birch Unit						
National forest	1,253.9	--	3.0	120.5	310.9	819.5
Bureau of Land Mgmt.	13.5	--	--	--	1.1	12.4
Miscellaneous federal	32.0	--	1.4	2.0	5.6	23.0
State	1,331.3	0.9	4.5	96.3	163.6	1,066.0
County and municipal	1,234.4	--	8.9	135.6	294.6	795.3
Indian	102.4	--	--	15.7	17.3	69.4
Forest industry	462.3	--	5.1	84.4	87.1	285.7
Farmer	206.5	--	--	30.1	48.8	127.6
Misc. private corporation	341.9	--	--	42.1	96.4	203.4
Misc. private individual	900.5	--	3.4	127.6	239.6	529.9
All owners	5,878.7	0.9	26.3	654.3	1,265.0	3,932.2
Northern Pine Unit						
National forest	567.2	1.5	18.8	176.2	130.3	240.4
Bureau of Land Mgmt.	12.6	--	--	1.3	5.4	5.9
Miscellaneous federal	70.5	--	--	7.3	23.3	39.9
State	1,370.5	--	7.8	187.1	289.5	886.1
County and municipal	1,204.6	--	13.8	271.2	343.9	575.7
Indian	380.6	--	4.1	51.9	74.2	250.4
Forest industry	285.0	--	2.6	74.2	98.9	109.3
Farmer	596.7	--	4.4	78.4	180.6	333.3
Misc. private corporation	155.3	--	0.8	36.2	48.6	69.7
Misc. private individual	1,332.5	1.6	17.4	292.1	392.5	628.9
All owners	5,975.5	3.1	69.7	1,175.9	1,587.2	3,139.6
Central Hardwood Unit						
Miscellaneous federal	55.3	--	1.2	7.5	15.5	31.1
State	298.2	1.3	0.6	61.5	102.8	132.0
County and municipal	59.6	--	--	6.6	26.3	26.7
Indian	7.6	--	--	--	3.0	4.6
Forest industry	4.0	--	--	--	0.6	3.4
Farmer	1,057.3	--	6.6	179.8	384.7	486.2
Misc. private corporation	94.9	--	1.2	7.9	34.7	51.1
Misc. private individual	698.5	--	9.0	144.6	248.0	296.9
All owners	2,275.4	1.3	18.6	407.9	815.6	1,032.0
Prairie Unit						
Miscellaneous federal	13.8	--	--	1.1	8.4	4.3
State	77.9	1.9	0.9	12.3	28.1	34.7
County and municipal	7.0	--	--	--	4.7	2.3
Farmer	371.7	2.0	6.5	51.9	135.5	175.8
Misc. private corporation	20.9	--	--	2.0	7.3	11.6
Misc. private individual	152.5	--	--	25.3	48.5	78.7
All owners	643.8	3.9	7.4	92.6	232.5	307.4

[1] International 1/4-inch rule.

Table 31.--Area of privately owned timberland by ownership class, owner tenure, and size of holding, Minnesota, 1990

(In thousand acres)

Ownership class and owner tenure class	All sizes	Size of holding (acres)								
		1-4	5-10	11-20	21-50	51-100	101-500	501-2,500	2,501-5,000	5,001+
Forest industry										
1-4 years	68.7	1.8	--	--	3.4	1.4	1.1	2.6	--	58.4
5-9 years	37.5	--	--	--	1.1	--	--	3.2	--	33.2
10-19 years	129.6	--	--	--	--	3.4	10.0	2.9	7.3	106.0
20+ years	515.5	--	--	--	6.9	5.7	20.7	25.9	7.9	448.4
All classes	751.3	1.8	--	--	11.4	10.5	31.8	34.6	15.2	646.0
Farmer										
1-4 years	339.2	14.0	21.3	45.6	91.7	72.6	88.6	4.1	--	1.3
5-9 years	287.3	13.4	25.1	33.2	77.6	57.4	73.1	7.5	--	--
10-19 years	714.5	15.4	43.4	86.4	173.8	177.8	190.3	20.7	4.0	2.7
20+ years	891.2	16.7	27.6	74.8	208.5	206.0	314.7	34.7	4.5	3.7
All classes	2,232.2	59.5	117.4	240.0	551.6	513.8	666.7	67.0	8.5	7.7
Misc. private corporation										
1-4 years	84.2	1.1	4.1	5.7	16.5	7.6	13.4	7.7	3.2	24.9
5-9 years	46.4	3.0	0.2	7.4	3.8	4.1	13.0	7.1	--	7.8
10-19 years	141.7	--	--	7.0	5.0	21.3	45.4	16.0	8.4	38.6
20+ years	340.7	--	--	4.2	14.1	18.9	58.3	37.3	19.5	188.4
All classes	613.0	4.1	4.3	24.3	39.4	51.9	130.1	68.1	31.1	259.7
Misc. private individual										
1-4 years	506.9	10.9	23.1	42.4	149.9	141.8	123.5	9.9	4.5	0.9
5-9 years	480.9	15.7	21.8	54.1	186.4	103.5	89.5	7.3	2.6	--
10-19 years	1,130.3	38.5	45.7	70.8	323.1	286.2	329.2	29.9	4.5	2.4
20+ years	965.9	28.6	18.3	26.8	254.1	250.8	355.4	24.0	--	7.9
All classes	3,084.0	93.7	108.9	194.1	913.5	782.3	897.6	71.1	11.6	11.2
All private owners										
1-4 years	999.0	27.8	48.5	93.7	261.5	223.4	226.6	24.3	7.7	85.5
5-9 years	852.1	32.1	47.1	94.7	268.9	165.0	175.6	25.1	2.6	41.0
10-19 years	2,116.1	53.9	89.1	164.2	501.9	488.7	574.9	69.5	24.2	149.7
20+ years	2,713.3	45.3	45.9	105.8	483.6	481.4	749.1	121.9	31.9	648.4
All classes	6,680.5	159.1	230.6	458.4	1,515.9	1,358.5	1,726.2	240.8	66.4	924.6

Table 32.--Area of timberland by ownership class and stand-volume class, and Forest Survey Unit, Minnesota, 1990

(In thousand acres)

Unit and ownership class	All classes	Stand-volume class (board feet[1])		
		Less than 1,500	1,500 to 5,000	5,000 +
All Units				
National forest	1,821.1	1,014.7	791.2	15.2
Bureau of Land Mgmt.	26.1	14.6	5.1	6.4
Miscellaneous federal	171.6	68.3	60.4	42.9
State	3,077.9	1,874.3	848.7	354.9
County and municipal	2,505.6	1,252.7	869.4	383.5
Indian	490.6	240.4	118.3	131.9
Forest industry	751.3	436.8	232.1	82.4
Farmer	2,232.2	1,178.2	770.6	283.4
Misc. private corporation	613.0	334.6	224.9	53.5
Misc. private individual	3,084.0	1,598.1	1,102.7	383.2
All owners	14,773.4	8,012.7	5,023.4	1,737.3
Aspen-Birch Unit				
National forest	1,253.9	732.0	518.3	3.6
Bureau of Land Mgmt.	13.5	12.4	1.1	--
Miscellaneous federal	32.0	12.5	18.2	1.3
State	1,331.3	885.3	426.2	19.8
County and municipal	1,234.4	732.0	488.7	13.7
Indian	102.4	59.3	41.0	2.1
Forest industry	462.3	292.4	158.2	11.7
Farmer	206.5	141.1	64.5	0.9
Misc. private corporation	341.9	212.2	125.1	4.6
Misc. private individual	900.5	550.6	345.0	4.9
All owners	5,878.7	3,629.8	2,186.3	62.6
Northern Pine Unit				
National forest	567.2	282.7	272.9	11.6
Bureau of Land Mgmt.	12.6	2.2	4.0	6.4
Miscellaneous federal	70.5	20.4	14.3	35.8
State	1,370.5	766.1	273.7	330.7
County and municipal	1,204.6	487.1	348.2	369.3
Indian	380.6	176.1	74.7	129.8
Forest industry	285.0	143.8	71.1	70.1
Farmer	596.7	228.6	93.4	274.7
Misc. private corporation	155.3	64.5	43.0	47.8
Misc. private individual	1,332.5	575.2	387.6	369.7
All owners	5,975.5	2,746.7	1,582.9	1,645.9
Central Hardwood Unit				
Miscellaneous federal	55.3	29.1	23.7	2.5
State	298.2	163.6	133.5	1.1
County and municipal	59.6	29.0	30.1	0.5
Indian	7.6	5.0	2.6	--
Forest industry	4.0	0.6	2.8	0.6
Farmer	1,057.3	574.4	476.2	6.7
Misc. private corporation	94.9	44.4	50.5	--
Misc. private individual	698.5	388.3	304.1	6.1
All owners	2,275.4	1,234.4	1,023.5	17.5
Prairie Unit				
Miscellaneous federal	13.8	6.3	4.2	3.3
State	77.9	59.3	15.3	3.3
County and municipal	7.0	4.6	2.4	--
Farmer	371.7	234.1	136.5	1.1
Misc. private corporation	20.9	13.5	6.3	1.1
Misc. private individual	152.5	84.0	66.0	2.5
All owners	643.8	401.8	230.7	11.3

[1] International 1/4-inch rule.

Table 33.--Area of timberland by forest type, stand-size class, and ownership class, Minnesota, 1990

(In thousand acres)

Forest type	All owners	Ownership class									
		National forest	Bureau of Land Mgmt.	Misc. federal	State	County & municipal	Indian	Forest industry	Farmer	Misc. private corporation	Misc. private individual
Jack pine											
Sawtimber	206.4	39.6	0.9	2.2	40.6	40.7	2.3	14.5	15.2	5.2	45.2
Poletimber	152.5	19.9	1.1	1.5	27.3	22.9	2.0	24.0	12.0	5.1	36.7
Sapling and seedling	88.6	14.7	--	1.3	25.3	6.8	1.5	12.5	4.6	2.2	19.7
All stands	447.5	74.2	2.0	5.0	93.2	70.4	5.8	51.0	31.8	12.5	101.6
Red pine											
Sawtimber	174.1	64.2	0.9	4.9	28.0	20.7	10.5	13.0	3.9	4.1	23.9
Poletimber	70.9	28.4	--	--	13.9	6.6	--	4.1	2.6	--	15.3
Sapling and seedling	56.6	15.2	--	--	9.2	12.3	2.1	10.7	--	1.1	6.0
All stands	301.6	107.8	0.9	4.9	51.1	39.6	12.6	27.8	6.5	5.2	45.2
White pine											
Sawtimber	52.8	13.4	--	0.9	5.7	2.0	1.9	5.3	3.6	4.5	15.5
Poletimber	8.5	--	--	--	--	2.7	--	0.7	1.2	0.6	3.3
Sapling and seedling	1.9	1.9	--	--	--	--	--	--	--	--	--
All stands	63.2	15.3	--	0.9	5.7	4.7	1.9	6.0	4.8	5.1	18.8
Balsam fir											
Sawtimber	181.5	48.3	--	--	27.2	48.7	4.2	7.2	11.2	6.9	27.8
Poletimber	315.9	83.5	--	1.3	68.3	62.9	4.0	32.8	12.6	20.2	30.3
Sapling and seedling	236.9	58.7	--	--	55.2	42.6	4.7	29.7	9.7	8.5	27.8
All stands	734.3	190.5	--	1.3	150.7	154.2	12.9	69.7	33.5	35.6	85.9
White spruce											
Sawtimber	31.9	6.5	1.0	--	4.7	9.6	1.7	4.3	--	0.9	3.2
Poletimber	34.1	10.3	--	--	3.4	2.4	1.1	5.3	--	0.9	10.7
Sapling and seedling	27.8	11.5	--	--	9.2	2.0	--	2.0	1.5	--	1.6
All stands	93.8	28.3	1.0	--	17.3	14.0	2.8	11.6	1.5	1.8	15.5
Black spruce											
Sawtimber	69.0	18.2	--	2.8	24.5	9.6	2.8	4.2	1.1	2.4	3.4
Poletimber	448.4	107.2	1.1	2.3	177.0	62.0	8.0	22.7	9.8	13.3	45.0
Sapling and seedling	804.7	123.4	9.2	4.1	360.4	134.4	31.1	35.8	21.8	22.2	62.3
All stands	1,322.1	248.8	10.3	9.2	561.9	206.0	41.9	62.7	32.7	37.9	110.7
Northern white-cedar											
Sawtimber	298.7	56.3	--	2.4	94.4	54.5	19.9	29.0	5.6	10.2	26.4
Poletimber	277.9	28.0	2.4	2.6	131.5	44.3	32.7	14.0	3.8	3.3	15.3
Sapling and seedling	103.9	7.7	--	2.8	62.2	13.1	8.0	4.2	1.1	1.1	3.7
All stands	680.5	92.0	2.4	7.8	288.1	111.9	60.6	47.2	10.5	14.6	45.4
Tamarack											
Sawtimber	102.9	11.1	--	1.4	32.4	15.6	10.7	--	10.2	2.7	18.8
Poletimber	252.3	11.4	--	2.2	109.6	46.9	17.1	4.2	20.5	7.9	32.5
Sapling and seedling	349.9	9.8	1.0	1.3	179.7	60.8	16.0	4.9	13.6	7.4	55.4
All stands	705.1	32.3	1.0	4.9	321.7	123.3	43.8	9.1	44.3	18.0	106.7

(Table 33 continued on the next page)

(Table 33 continued)

Forest type	All owners	Ownership class									
		National forest	Bureau of Land Mgmt.	Misc. federal	State	County & municipal	Indian	Forest industry	Farmer	Misc. private corporation	Misc. private individual
Oak-hickory											
Sawtimber	785.5	2.7	--	25.4	70.2	22.2	4.3	--	432.0	28.4	200.3
Poletimber	299.4	3.3	--	16.4	21.3	26.9	2.2	1.0	105.2	12.2	110.9
Sapling and seedling	99.4	5.0	--	--	14.8	8.4	1.6	5.9	39.2	4.1	20.4
All stands	1,184.3	11.0	--	41.8	106.3	57.5	8.1	6.9	576.4	44.7	331.6
Elm-ash-soft maple											
Sawtimber	404.2	17.6	0.7	15.5	49.5	58.3	7.0	15.8	134.5	11.9	93.4
Poletimber	505.5	17.2	0.9	2.8	88.5	98.0	15.6	23.4	80.8	17.8	160.5
Sapling and seedling	381.8	24.3	--	0.8	61.6	57.8	17.5	26.3	66.5	22.0	105.0
All stands	1,291.5	59.1	1.6	19.1	199.6	214.1	40.1	65.5	281.8	51.7	358.9
Maple basswood											
Sawtimber	763.9	71.5	--	17.3	74.3	91.5	27.1	17.6	253.7	25.4	185.5
Poletimber	387.6	20.1	--	5.3	37.3	77.7	10.5	11.5	85.9	17.4	121.9
Sapling and seedling	251.4	22.2	--	1.5	19.5	17.8	3.9	21.6	96.6	17.6	50.7
All stands	1,402.9	113.8	--	24.1	131.1	187.0	41.5	50.7	436.2	60.4	358.1
Aspen											
Sawtimber	1,513.7	211.5	4.7	15.3	208.6	311.8	48.1	56.2	181.3	68.0	408.2
Poletimber	1,844.7	200.2	1.1	13.3	332.8	378.6	68.1	76.8	240.0	69.0	464.8
Sapling and seedling	1,755.8	238.8	--	7.7	338.9	334.8	44.4	150.4	191.8	106.8	342.2
All stands	5,114.2	650.5	5.8	36.3	880.3	1,025.2	160.6	283.4	613.1	243.8	1,215.2
Paper birch											
Sawtimber	198.9	35.7	--	3.2	24.9	41.5	11.5	8.4	12.6	11.5	49.6
Poletimber	505.8	93.0	--	5.0	59.7	140.9	15.6	16.6	35.3	33.4	106.3
Sapling and seedling	131.1	38.9	--	--	23.8	13.0	4.6	10.4	8.8	10.3	21.3
All stands	835.8	167.6	--	8.2	108.4	195.4	31.7	35.4	56.7	55.2	177.2
Balsam poplar											
Sawtimber	111.8	12.3	--	--	22.6	28.8	--	6.7	18.5	3.7	19.2
Poletimber	157.1	1.1	--	2.1	37.6	25.5	13.5	4.1	28.6	7.8	36.8
Sapling and seedling	158.8	7.7	--	3.1	45.7	21.8	2.4	10.1	27.1	10.1	30.8
All stands	427.7	21.1	--	5.2	105.9	76.1	15.9	20.9	74.2	21.6	86.8
Nonstocked	168.9	8.8	1.1	2.9	56.6	26.2	10.4	3.4	28.2	4.9	26.4
All types											
Sawtimber	4,895.3	608.9	8.2	91.3	707.6	755.5	152.0	182.2	1,083.4	185.8	1,120.4
Poletimber	5,260.6	623.6	6.6	54.8	1,108.2	998.3	190.4	241.2	638.3	208.9	1,190.3
Sapling and seedling	4,448.6	579.8	10.2	22.6	1,205.5	725.6	137.8	324.5	482.3	213.4	746.9
Nonstocked	168.9	8.8	1.1	2.9	56.6	26.2	10.4	3.4	28.2	4.9	26.4
All stands	14,773.4	1,821.1	26.1	171.6	3,077.9	2,505.6	490.6	751.3	2,232.2	613.0	3,084.0

Table 34.--Area of timberland by forest type, stand-size class, and potential productivity class, Minnesota, 1990

(In thousand acres)

Forest type and stand-size class	All classes	Potential productivity class (cubic feet of growth per acre per year)				
		165+	120-164	85-119	50-84	20-49
Jack pine						
Sawtimber	206.4	--	1.4	18.4	97.1	89.5
Poletimber	152.5	--	--	11.8	76.7	64.0
Sapling and seedling	88.6	--	--	3.6	29.1	55.9
All stands	447.5	--	1.4	33.8	202.9	209.4
Red pine						
Sawtimber	174.1	--	17.6	74.6	61.4	20.5
Poletimber	70.9	--	25.3	34.2	9.9	1.5
Sapling and seedling	56.6	--	2.8	30.7	22.0	1.1
All stands	301.6	--	45.7	139.5	93.3	23.1
White pine						
Sawtimber	52.8	--	1.2	19.7	17.4	14.5
Poletimber	8.5	--	2.6	2.9	1.0	2.0
Sapling and seedling	1.9	--	--	--	1.9	--
All stands	63.2	--	3.8	22.6	20.3	16.5
Balsam fir						
Sawtimber	181.5	--	--	--	--	181.5
Poletimber	315.9	--	--	--	--	315.9
Sapling and seedling	236.9	--	--	--	--	236.9
All stands	734.3	--	--	--		734.3
White spruce						
Sawtimber	31.9	--	--	--	--	31.9
Poletimber	34.1	--	--	--	--	34.1
Sapling and seedling	27.8	--	--	--	--	27.8
All stands	93.8	--	--	--	--	93.8
Black spruce						
Sawtimber	69.0	--	--	--	--	69.0
Poletimber	448.4	--	--	--	--	448.4
Sapling and seedling	804.7	--	--	--	--	804.7
All stands	1,322.1	--	--	--	--	1,322.1
Northern white-cedar						
Sawtimber	298.7	--	--	--	--	298.7
Poletimber	277.9	--	--	--	--	277.9
Sapling and seedling	103.9	--	--	--	--	103.9
All stands	680.5	--	--		--	680.5
Tamarack						
Sawtimber	102.9	--	--	--	--	102.9
Poletimber	252.3	--	--	--	--	252.3
Sapling and seedling	349.9	--	--	--	--	349.9
All stands	705.1	--	--		--	705.1
Oak-hickory				--		
Sawtimber	785.5	--	--	12.6	340.7	432.2
Poletimber	299.4	--	--	3.2	109.3	186.9
Sapling and seedling	99.4	--	--	--	52.7	46.7
All stands	1,184.3	--	--	15.8	502.7	665.8

(Table 34 continued on next page)

(Table 34 continued)

Forest type and stand-size class	All classes	Potential productivity class (cubic feet of growth per acre per year) 165+	120-164	85-119	50-84	20-49
Elm-ash-soft maple						
Sawtimber	404.2	--	1.2	42.1	114.9	246.0
Poletimber	505.5	--	--	13.4	56.4	435.7
Sapling and seedling	381.8	--	--	13.3	54.7	313.8
All stands	1,291.5	--	1.2	68.8	226.0	995.5
Maple-basswood						
Sawtimber	763.9	4.2	5.1	97.1	117.4	540.1
Poletimber	387.6	--	--	42.3	35.5	309.8
Sapling and seedling	251.4	1.0	2.3	56.9	41.7	149.5
All stands	1,402.9	5.2	7.4	196.3	194.6	999.4
Aspen						
Sawtimber	1,513.7	1.6	28.6	609.9	777.3	96.3
Poletimber	1,844.7	2.4	18.9	688.1	935.9	199.4
Sapling and seedling	1,755.8	--	11.9	549.8	921.6	272.5
All stands	5,114.2	4.0	59.4	1,847.8	2,634.8	568.2
Paper birch						
Sawtimber	198.9	--	--	--	--	198.9
Poletimber	505.8	--	--	--	--	505.8
Sapling and seedling	131.1	--	--	--	--	131.1
All stands	835.8	--	--	--	--	835.8
Balsam poplar						
Sawtimber	111.8	--	--	--	--	111.8
Poletimber	157.1	--	--	--	--	157.1
Sapling and seedling	158.8	--	--	--	--	158.8
All stands	427.7	--	--	--	--	427.7
Nonstocked	168.9	--	3.1	6.1	25.7	134.0
All types						
Sawtimber	4,895.3	5.8	55.1	874.4	1,526.2	2,433.8
Poletimber	5,260.6	2.4	46.8	795.9	1,224.7	3,190.8
Sapling and seedling	4,448.6	1.0	17.0	654.3	1,123.7	2,652.6
Nonstocked	168.9	--	3.1	6.1	25.7	134.0
All stands	14,773.4	9.2	122.0	2,330.7	3,900.3	8,411.2

Table 35.--Area of timberland by forest type, stand-age class, and Forest Survey Unit, Minnesota, 1990

(In thousand acres)

Unit and forest type	All classes	Stand-age class (years) 1-20	21- 40	41-60	61-80	81-100	101-120	121-140	141+
All Units									
Jack pine	447.5	77.9	85.2	162.9	95.1	18.9	5.4	1.1	1.0
Red pine	301.6	61.7	74.6	57.8	54.3	34.9	14.3	3.4	0.6
White pine	63.2	3.1	2.9	6.4	24.2	10.7	13.5	2.4	--
Balsam fir	734.3	144.1	132.9	271.8	135.1	38.7	10.7	1.0	--
White spruce	93.8	21.3	28.0	23.3	12.1	8.4	--	0.7	--
Black spruce	1,322.1	156.6	349.9	346.6	272.7	125.5	45.1	12.3	13.4
Northern white-cedar	680.5	20.0	55.9	54.5	134.7	157.3	95.0	77.5	85.6
Tamarack	705.1	127.7	170.6	125.4	110.5	93.2	25.2	33.1	19.4
Oak-hickory	1,184.3	87.9	69.1	297.8	347.3	253.2	109.4	15.8	3.8
Elm-ash-soft maple	1,291.5	285.7	161.5	270.4	299.1	160.5	63.2	32.3	18.8
Maple-basswood	1,402.9	218.0	112.0	379.7	369.2	216.8	79.5	18.8	8.9
Aspen	5,114.2	1,520.0	944.0	1,592.3	879.4	144.0	19.2	5.1	10.2
Paper birch	835.8	87.0	97.9	317.2	262.3	53.2	7.9	9.4	0.9
Balsam poplar	427.7	129.5	75.6	146.9	50.2	21.4	2.5	1.1	0.5
Nonstocked	168.9	124.0	3.5	18.2	12.9	6.4	2.6	1.3	--
All types	14,773.4	3,064.5	2,363.6	4,071.2	3,059.1	1,343.1	493.5	215.3	163.1
Aspen-Birch Unit									
Jack pine	138.0	31.5	20.3	34.9	32.9	11.9	5.4	1.1	--
Red pine	121.0	19.9	27.0	21.7	24.7	20.1	4.5	2.5	0.6
White pine	33.3	1.9	0.6	0.7	11.8	6.8	11.5	--	--
Balsam fir	545.8	115.9	103.3	193.4	91.6	29.9	10.7	1.0	--
White spruce	66.2	15.4	16.8	20.5	7.6	5.2	--	0.7	--
Black spruce	943.2	96.9	243.4	250.5	205.0	93.0	36.0	8.7	9.7
Northern white-cedar	444.0	14.0	43.0	27.9	82.5	99.9	64.7	52.6	59.4
Tamarack	255.3	49.0	67.7	50.1	34.0	29.1	6.5	12.4	6.5
Oak-hickory	9.3	4.7	--	1.7	1.3	1.6	--	--	--
Elm-ash-soft maple	387.8	94.4	43.8	63.1	82.9	59.2	21.3	12.6	10.5
Maple-basswood	264.5	43.7	25.7	80.9	40.4	42.1	20.5	9.3	1.9
Aspen	1,991.1	616.7	383.3	555.9	356.2	62.5	10.5	3.8	2.2
Paper birch	458.2	49.0	53.1	162.6	149.3	35.2	5.1	3.9	--
Balsam poplar	156.6	48.3	15.7	53.9	24.2	11.5	1.4	1.1	0.5
Nonstocked	64.4	59.6	2.4	1.3	1.1	--	--	--	--
All types	5,878.7	1,260.9	1,046.1	1,519.1	1,145.5	508.0	198.1	109.7	91.3
Northern Pine Unit									
Jack pine	290.7	40.2	59.2	121.1	62.2	7.0	--	--	1.0
Red pine	167.0	41.8	39.8	30.8	29.6	14.3	9.8	0.9	--
White pine	24.3	1.2	2.3	3.8	11.4	1.2	2.0	2.4	--
Balsam fir	180.2	25.7	29.6	74.4	41.7	8.8	--	--	--
White spruce	27.4	5.9	11.0	2.8	4.5	3.2	--	--	--
Black spruce	348.2	54.4	94.0	95.7	55.2	32.5	9.1	3.6	3.7
Northern white-cedar	236.5	6.0	12.9	26.6	52.2	57.4	30.3	24.9	26.2
Tamarack	403.8	65.2	91.0	67.2	69.0	60.3	18.7	19.5	12.9
Oak-hickory	304.1	37.8	19.9	115.2	77.1	42.2	5.7	5.0	1.2
Elm-ash-soft maple	489.6	94.6	54.8	103.4	123.2	63.0	29.7	13.6	7.3
Maple-basswood	496.5	33.0	36.7	156.9	154.3	83.0	22.7	6.3	3.6
Aspen	2,379.1	678.9	407.2	769.9	434.9	70.2	8.7	1.3	8.0
Paper birch	321.2	30.5	33.1	131.3	102.1	16.7	1.1	5.5	0.9
Balsam poplar	229.5	69.6	50.0	72.9	26.0	9.9	1.1	--	--
Nonstocked	77.4	56.8	1.1	6.8	9.4	0.9	1.1	1.3	--
All types	5,975.5	1,241.6	942.6	1,778.8	1,252.8	470.6	140.0	84.3	64.8

(Table 35 continued on next page)

(Table 35 continued)

Unit and forest type	All classes	Stand-age class (years)							
		1-20	21- 40	41-60	61-80	81-100	101-120	121-140	141+
Central Hardwood Unit									
Jack pine	18.8	6.2	5.7	6.9	--	--	--	--	--
Red pine	12.5	--	7.8	4.2	--	0.5	--	--	--
White pine	4.6	--	--	1.9	--	2.7	--	--	--
Balsam fir	8.3	2.5	--	4.0	1.8	--	--	--	--
White spruce	0.2	--	0.2	--	--	--	--	--	--
Black spruce	28.7	5.3	11.6	0.4	11.4	--	--	--	--
Tamarack	40.8	9.4	10.8	8.1	7.5	3.8	--	1.2	--
Oak-hickory	748.1	30.8	44.2	167.5	227.4	178.6	90.0	7.0	2.6
Elm-ash-soft maple	311.1	81.1	45.9	70.6	65.8	30.6	10.0	6.1	1.0
Maple-basswood	480.0	112.4	43.3	107.7	120.5	68.0	22.6	2.1	3.4
Aspen	532.1	123.5	112.6	214.6	70.1	11.3	--	--	--
Paper birch	56.4	7.5	11.7	23.3	10.9	1.3	1.7	--	--
Balsam poplar	13.7	2.1	1.4	10.2	--	--	--	--	--
Nonstocked	20.1	4.6	--	7.0	2.4	4.6	1.5	--	--
All types	2,275.4	385.4	295.2	626.4	517.8	301.4	125.8	16.4	7.0
Prairie Unit									
Red pine	1.1	--	--	1.1	--	--	--	--	--
White pine	1.0	--	--	--	1.0	--	--	--	--
Black spruce	2.0	--	0.9	--	1.1	--	--	--	--
Tamarack	5.2	4.1	1.1	--	--	--	--	--	--
Oak-hickory	122.8	14.6	5.0	13.4	41.5	30.8	13.7	3.8	--
Elm-ash-soft maple	103.0	15.6	17.0	33.3	27.2	7.7	2.2	--	--
Maple-basswood	161.9	28.9	6.3	34.2	54.0	23.7	13.7	1.1	--
Aspen	211.9	100.9	40.9	51.9	18.2	--	--	--	--
Balsam poplar	27.9	9.5	8.5	9.9	--	--	--	--	--
Nonstocked	7.0	3.0	--	3.1	--	0.9	--	--	--
All types	643.8	176.6	79.7	146.9	143.0	63.1	29.6	4.9	--

Table 36.--Area of timberland by forest type, site-index class, and Forest Survey Unit, Minnesota, 1990

(In thousand acres)

Unit and forest type	All classes	Site-index class (feet)								
		11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91+
All Units										
Jack pine	447.5	--	--	10.9	75.5	155.6	147.1	50.6	7.8	--
Red pine	301.6	0.6	--	7.7	30.3	93.5	94.2	66.6	8.7	--
White pine	63.2	--	--	2.8	21.6	15.9	15.2	6.5	1.2	--
Balsam fir	734.3	--	19.7	118.6	260.5	237.6	77.7	16.8	3.4	--
White spruce	93.8	--	--	6.0	20.8	26.6	25.3	13.0	2.1	--
Black spruce	1,322.1	25.3	402.3	483.8	315.2	63.4	25.1	5.6	1.4	--
Northern white-cedar	680.5	111.7	326.8	148.2	57.4	15.7	19.2	1.5	--	--
Tamarack	705.1	10.5	115.5	218.9	200.4	102.6	44.2	13.0	--	--
Oak-hickory	1,184.3	--	6.2	121.1	290.0	290.5	276.1	141.9	47.5	11.0
Elm-ash-soft maple	1,291.5	--	17.2	180.1	317.2	395.1	210.1	115.8	43.1	12.9
Maple-basswood	1,402.9	--	2.1	28.4	225.7	404.3	378.8	248.5	99.0	16.1
Aspen	5,114.2	3.4	0.7	59.4	271.8	978.7	1,746.8	1,474.4	542.8	36.2
Paper birch	835.8	--	--	28.6	162.4	325.0	221.7	84.2	12.8	1.1
Balsam poplar	427.7	--	0.9	20.5	66.9	115.9	133.6	66.2	22.8	0.9
Nonstocked	168.9	16.8	9.5	19.3	46.0	48.7	10.6	11.3	2.1	3.1
All types	14,773.4	168.3	900.9	1,454.3	2,361.7	3,269.1	3,425.7	2,315.9	794.7	81.3
Aspen-Birch Unit										
Jack pine	138.0	--	--	1.3	37.6	46.2	36.9	14.9	1.1	--
Red pine	121.0	0.6	--	3.1	17.7	46.4	31.3	20.4	1.5	--
White pine	33.3	--	--	2.8	16.1	8.6	5.8	--	--	--
Balsam fir	545.8	--	13.4	102.7	212.3	172.5	39.8	5.1	--	--
White spruce	66.2	--	--	6.0	16.0	19.8	19.3	4.1	1.0	--
Black spruce	943.2	16.6	283.2	363.0	226.5	37.1	13.7	3.1	--	--
Northern white-cedar	444.0	80.9	228.8	84.4	30.0	7.0	12.6	0.3	--	--
Tamarack	255.3	5.2	48.2	75.9	70.0	34.9	17.9	3.2	--	--
Oak-hickory	9.3	--	--	2.6	3.4	2.5	0.8	--	--	--
Elm-ash-soft maple	387.8	--	8.8	86.7	133.7	114.4	34.4	7.5	2.3	--
Maple-basswood	264.5	--	2.1	11.0	90.6	113.5	38.4	6.4	2.5	--
Aspen	1,991.1	2.0	--	31.1	125.4	494.7	697.1	484.8	147.1	8.9
Paper birch	458.2	--	--	18.1	123.9	211.4	81.3	22.4	1.1	--
Balsam poplar	156.6	--	--	6.6	21.1	43.1	52.1	26.9	5.9	0.9
Nonstocked	64.4	3.3	4.9	12.7	16.8	15.3	6.1	5.3	--	--
All types	5,878.7	108.6	589.4	808.0	1,141.1	1,367.4	1,087.5	604.4	162.5	9.8
Northern Pine Unit										
Jack pine	290.7	--	--	7.9	36.8	105.8	105.9	29.7	4.6	--
Red pine	167.0	--	--	4.6	12.6	45.0	56.6	41.6	6.6	--
White pine	24.3	--	--	--	4.5	7.1	6.9	4.6	1.2	--
Balsam fir	180.2	--	4.9	15.9	46.6	60.9	36.8	11.7	3.4	--
White spruce	27.4	--	--	0.0	4.6	6.8	6.0	8.9	1.1	--
Black spruce	348.2	8.7	113.5	113.7	78.4	21.3	8.7	2.5	1.4	--
Northern white-cedar	236.5	30.8	98.0	63.8	27.4	8.7	6.6	1.2	--	--
Tamarack	403.8	3.9	67.3	134.0	107.2	64.5	20.9	6.0	--	--
Oak-hickory	304.1	--	2.9	36.5	83.0	92.7	63.3	21.4	2.4	1.9
Elm-ash-soft maple	489.6	--	5.2	82.6	131.2	176.7	64.6	26.2	2.0	1.1
Maple-basswood	496.5	--	--	8.5	77.9	159.9	154.5	81.7	13.0	1.0
Aspen	2,379.1	1.4	0.7	19.0	105.3	343.4	792.8	772.9	322.2	21.4
Paper birch	321.2	--	--	8.8	33.7	104.6	118.1	44.9	11.1	--
Balsam poplar	229.5	--	0.9	12.8	33.8	68.1	68.7	29.5	15.7	--
Nonstocked	77.4	13.5	4.6	6.0	21.2	25.7	3.3	1.6	--	--
All types	5,975.5	58.3	298.0	514.1	804.2	1,291.2	1,513.7	1,084.4	384.7	25.4

(Table 36 continued on next page)

(Table 36 continued)

Unit and forest type	All classes	Site-index class (feet)								
		11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91+
Central Hardwood Unit										
Jack pine	18.8	--	--	1.7	1.1	3.6	4.3	6.0	2.1	--
Red pine	12.5	--	--	--	--	2.1	5.2	4.6	0.6	--
White pine	4.6	--	--	--	--	0.2	2.5	1.9	--	--
Balsam fir	8.3	--	1.4	--	1.6	4.2	1.1	--	--	--
White spruce	0.2	--	--	--	0.2	--	--	--	--	--
Black spruce	28.7	--	5.6	7.1	8.3	5.0	2.7	--	--	--
Tamarack	40.8	1.4	--	9.0	19.1	3.2	5.4	2.7	--	--
Oak-hickory	748.1	--	1.4	59.8	171.7	170.3	184.2	113.1	38.5	9.1
Elm-ash-soft maple	311.1	--	3.2	9.7	44.4	82.6	74.1	58.0	28.4	10.7
Maple-basswood	480.0	--	--	5.1	42.4	99.8	139.8	123.7	62.3	6.9
Aspen	532.1	--	--	3.8	16.7	74.5	192.3	168.7	70.2	5.9
Paper birch	56.4	--	--	1.7	4.8	9.0	22.3	16.9	0.6	1.1
Balsam poplar	13.7	--	--	--	4.3	1.4	2.3	4.5	1.2	--
Nonstocked	20.1	--	--	0.6	8.0	4.7	1.2	4.4	1.2	--
All types	2,275.4	1.4	11.6	98.5	322.6	460.6	637.4	504.5	205.1	33.7
Prairie Unit										
Red pine	1.1	--	--	--	--	--	1.1	--	--	--
White pine	1.0	--	--	--	1.0	--	--	--	--	--
Black spruce	2.0	--	--	--	2.0	--	--	--	--	--
Tamarack	5.2	--	--	--	4.1	--	--	1.1	--	--
Oak-hickory	122.8	--	1.9	22.2	31.9	25.0	27.8	7.4	6.6	--
Elm-ash-soft maple	103.0	--	--	1.1	7.9	21.4	37.0	24.1	10.4	1.1
Maple-basswood	161.9	--	--	3.8	14.8	31.1	46.1	36.7	21.2	8.2
Aspen	211.9	--	--	5.5	24.4	66.1	64.6	48.0	3.3	--
Balsam poplar	27.9	--	--	1.1	7.7	3.3	10.5	5.3	--	--
Nonstocked	7.0	--	--	--	--	3.0	--	--	0.9	3.1
All types	643.8	--	1.9	33.7	93.8	149.9	187.1	122.6	42.4	12.4

Table 37.--Area of timberland by forest type, basal-area class, and stand-size class, Minnesota, 1990

(In thousand acres)

Forest type and stand-size class	All classes	Basal-area class (square feet per acre)													
		0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-120	121-150	151-180	181+
Jack pine															
Sawtimber	206.4	--	--	8.4	3.8	6.0	21.1	12.3	19.7	25.9	28.5	39.4	32.9	8.4	--
Poletimber	152.5	--	--	2.3	--	4.5	5.5	5.6	22.8	14.0	26.6	30.3	30.5	9.6	0.8
Sapling and seedling	88.6	30.2	13.3	15.6	6.1	2.7	5.6	7.3	5.7	2.1	--	--	--	--	--
Total	447.5	30.2	13.3	26.3	9.9	13.2	32.2	25.2	48.2	42.0	55.1	69.7	63.4	18.0	0.8
Red pine															
Sawtimber	174.1	--	1.2	--	3.9	--	8.5	13.3	11.4	13.4	10.3	28.8	48.8	26.0	8.5
Poletimber	70.9	--	--	0.8	--	5.3	7.1	2.1	3.8	4.1	3.0	17.7	14.3	7.4	5.3
Sapling and seedling	56.6	21.7	6.6	1.3	6.8	11.6	5.5	--	1.0	--	1.1	1.0	--	--	--
Total	301.6	21.7	7.8	2.1	10.7	16.9	21.1	15.4	16.2	17.5	14.4	47.5	63.1	33.4	13.8
White pine															
Sawtimber	52.8	--	--	--	--	1.1	2.6	1.0	3.6	2.2	7.3	12.0	15.2	5.4	2.4
Poletimber	8.5	--	--	--	--	--	--	1.3	2.6	--	--	3.6	--	1.0	--
Sapling and seedling	1.9	--	--	--	--	--	1.9	--	--	--	--	--	--	--	--
Total	63.2	--	--	--	--	1.1	4.5	2.3	6.2	2.2	7.3	15.6	15.2	6.4	2.4
Balsam fir															
Sawtimber	181.5	--	0.9	1.1	4.9	8.0	12.6	13.9	16.1	26.5	11.9	40.1	34.7	10.8	--
Poletimber	315.9	--	1.0	12.4	7.3	19.3	30.9	17.6	28.7	29.7	25.4	63.6	58.0	16.5	5.5
Sapling and seedling	236.9	24.4	19.1	38.7	24.5	33.9	35.4	13.2	15.3	10.6	3.3	9.9	8.6	--	--
Total	734.3	24.4	21.0	52.2	36.7	61.2	78.9	44.7	60.1	66.8	40.6	113.6	101.3	27.3	5.5
White spruce															
Sawtimber	31.9	--	1.1	0.7	1.1	2.2	6.2	--	4.5	2.3	1.3	5.4	4.0	3.1	--
Poletimber	34.1	--	1.2	2.0	--	2.3	6.8	--	4.9	--	1.5	7.4	5.7	2.3	--
Sapling and seedling	27.8	10.4	3.5	1.5	2.4	3.2	1.4	--	5.4	--	--	--	--	--	--
Total	93.8	10.4	5.8	4.2	3.5	7.7	14.4	--	14.8	2.3	2.8	12.8	9.7	5.4	--
Black spruce															
Sawtimber	69.0	--	4.2	--	5.3	7.5	9.2	5.1	9.1	6.2	5.2	11.0	3.4	2.8	--
Poletimber	448.4	--	2.4	1.1	13.8	29.4	44.2	41.7	45.7	65.5	41.3	81.9	58.7	18.0	4.7
Sapling and seedling	804.7	62.3	93.2	84.9	66.3	110.6	84.4	56.2	65.1	57.6	37.0	60.0	24.8	2.3	--
Total	1,322.1	62.3	99.8	86.0	85.4	147.5	137.8	103.0	119.9	129.3	83.5	152.9	86.9	23.1	4.7
Northern white-cedar															
Sawtimber	298.7	--	2.6	--	2.5	13.2	13.1	8.4	19.5	23.2	16.8	42.7	75.1	59.3	22.3
Poletimber	277.9	--	2.2	2.5	7.0	2.4	6.2	5.0	14.9	15.4	21.0	47.9	80.1	38.1	35.2
Sapling and seedling	103.9	4.7	6.0	3.7	6.9	12.7	11.3	9.8	15.3	4.3	2.3	21.7	5.2	--	--
Total	680.5	4.7	10.8	6.2	16.4	28.3	30.6	23.2	49.7	42.9	40.1	112.3	160.4	97.4	57.5

(Table 37 continued on next page)

(Table 37 continued)

Forest type and stand-size class	All classes	Basal-area class (square feet per acre)													
		0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-120	121-150	151-180	181+
Tamarack															
Sawtimber	102.9	--	6.9	11.4	10.6	16.9	17.5	12.2	5.4	4.1	8.9	5.8	1.1	2.1	--
Poletimber	252.3	--	8.4	8.9	13.9	27.4	33.2	29.1	39.7	31.2	21.5	31.4	6.5	1.1	--
Sapling and seedling	349.9	68.8	45.6	42.2	30.7	46.8	41.2	19.9	21.6	14.8	6.6	8.0	3.7	--	--
Total	705.1	68.8	60.9	62.5	55.2	91.1	91.9	61.2	66.7	50.1	37.0	45.2	11.3	3.2	--
Oak-hickory															
Sawtimber	785.5	1.1	2.3	2.9	6.3	35.2	46.5	43.8	86.7	94.4	91.3	191.9	155.6	25.5	2.0
Poletimber	299.4	--	1.0	4.7	3.2	14.9	37.9	24.1	20.9	38.8	31.2	64.4	52.5	5.8	--
Sapling and seedling	99.4	21.3	13.1	12.1	9.2	17.7	13.6	5.7	4.7	2.0	--	--	--	--	--
Total	1,184.3	22.4	16.4	19.7	18.7	67.8	98.0	73.6	112.3	135.2	122.5	256.3	208.1	31.3	2.0
Elm-ash-soft maple															
Sawtimber	404.2	--	5.4	11.4	19.5	23.2	31.6	31.4	49.0	48.5	26.1	72.3	61.7	20.4	3.7
Poletimber	505.5	0.9	4.0	13.5	14.5	44.3	31.8	37.0	74.8	60.8	38.3	108.7	59.0	14.0	3.9
Sapling and seedling	381.8	47.0	66.6	78.9	33.3	68.4	46.5	17.6	11.6	3.7	4.2	4.0	--	--	--
Total	1,291.5	47.9	76.0	103.8	67.3	135.9	109.9	86.0	135.4	113.0	68.6	185.0	120.7	34.4	7.6
Maple-basswood															
Sawtimber	763.9	3.0	2.9	9.6	5.9	14.7	48.1	31.1	64.0	77.7	77.2	184.8	183.4	58.2	3.3
Poletimber	387.6	--	1.9	2.7	1.1	11.2	28.9	14.8	43.9	40.6	41.1	83.1	92.7	23.7	1.9
Sapling and seedling	251.4	17.5	20.7	37.4	21.3	37.3	45.4	25.9	25.0	12.3	5.0	0.9	2.7	--	--
Total	1,402.9	20.5	25.5	49.7	28.3	63.2	122.4	71.8	132.9	130.6	123.3	268.8	278.8	81.9	5.2
Aspen															
Sawtimber	1,513.7	--	6.4	20.1	33.0	81.6	95.2	107.3	137.1	175.7	124.1	345.1	271.3	97.6	19.2
Poletimber	1,844.7	--	18.8	24.8	35.8	85.0	160.9	118.4	233.6	242.4	168.7	388.5	258.3	101.1	8.4
Sapling and seedling	1,755.8	321.9	209.2	247.1	178.2	237.3	190.3	116.4	125.1	61.9	32.8	29.0	5.4	1.2	--
Total	5,114.2	321.9	234.4	292.0	247.0	403.9	446.4	342.1	495.8	480.0	325.6	762.6	535.0	199.9	27.6
Paper birch															
Sawtimber	198.9	2.1	3.4	1.7	3.3	11.0	14.5	21.3	28.0	24.3	17.5	36.7	29.4	5.7	--
Poletimber	505.8	--	1.0	6.3	10.6	16.0	38.7	31.1	59.3	49.4	41.0	103.9	112.2	29.4	6.9
Sapling and seedling	131.1	19.6	14.0	26.1	10.2	14.5	19.8	7.0	8.0	3.6	2.8	2.1	3.4	--	--
Total	835.8	21.7	18.4	34.1	24.1	41.5	73.0	59.4	95.3	77.3	61.3	142.7	145.0	35.1	6.9
Balsam poplar															
Sawtimber	111.8	--	3.1	4.7	1.2	10.0	4.9	14.4	8.8	10.5	9.6	21.1	13.3	2.6	7.6
Poletimber	157.1	--	1.4	10.4	14.0	25.8	12.5	12.1	13.8	21.4	7.7	23.1	9.2	5.7	--
Sapling and seedling	158.8	39.4	16.6	25.5	14.5	19.8	20.1	10.7	2.7	2.0	5.2	2.3	--	--	--
Total	427.7	39.4	21.1	40.6	29.7	55.6	37.5	37.2	25.3	33.9	22.5	46.5	22.5	8.3	7.6
Nonstocked	168.9	145.5	23.4	--	--	--	--	--	--	--	--	--	--	--	--
All types															
Sawtimber	4,895.3	6.2	40.4	72.0	101.3	230.6	331.6	315.5	462.9	534.9	436.0	1,037.1	929.9	327.9	69.0
Poletimber	5,260.6	0.9	43.3	92.4	121.2	287.8	444.6	339.9	609.4	613.3	468.3	1,055.5	837.7	273.7	72.6
Sapling and seedling	4,448.6	689.2	527.5	615.0	410.4	616.5	522.4	289.7	306.5	174.9	100.3	138.9	53.8	3.5	--
Nonstocked	168.9	145.5	23.4	--	--	--	--	--	--	--	--	--	--	--	--
All stands	14,773.4	841.8	634.6	779.4	632.9	1,134.9	1,298.6	945.1	1,378.8	1,323.1	1,004.6	2,231.5	1,821.4	605.1	141.6

Table 38.--Area of timberland by stocking class based on selected stand components and Forest Survey Unit, Minnesota, 1990

(In thousand acres)

Stocking class (percent)	Stocking classified in terms of: All live trees	Growing-stock trees	Rough and rotten trees
All Units			
0-10	122.7	176.2	8,773.1
11-20	93.7	187.7	2,931.5
21-30	168.8	325.5	1,469.6
31-40	310.2	618.9	810.4
41-50	487.8	884.9	399.9
51-60	733.6	1,059.6	200.4
61-70	962.8	1,308.4	92.7
71-80	1,087.8	1,439.3	53.0
81-90	1,288.9	1,363.0	19.0
91-100	1,494.6	1,497.4	11.2
101-110	1,634.7	1,477.1	7.0
111-120	1,707.6	1,377.2	4.8
121-130	1,660.6	1,110.8	--
131-140	1,327.5	838.8	--
141-150	981.8	637.0	0.8
151-160	488.1	311.3	--
161+	222.2	160.3	--
All classes	14,773.4	14,773.4	14,773.4
Aspen-Birch Unit			
0-10	42.0	55.6	4,199.9
11-20	36.6	58.2	970.3
21-30	61.3	113.5	397.9
31-40	108.5	190.4	168.8
41-50	184.3	285.0	68.1
51-60	267.3	336.7	37.3
61-70	367.3	384.7	14.5
71-80	381.7	478.0	13.6
81-90	442.4	481.7	5.8
91-100	556.4	595.1	1.1
101-110	664.6	669.5	1.4
111-120	631.7	611.8	--
121-130	703.5	543.5	--
131-140	562.8	451.1	--
141-150	508.9	364.4	--
151-160	245.5	176.5	--
161+	113.9	83.0	--
All classes	5,878.7	5,878.7	5,878.7
Northern Pine Unit			
0-10	60.4	77.4	3,701.8
11-20	41.2	62.9	1,250.0
21-30	66.8	119.8	578.1
31-40	143.7	250.7	283.0
41-50	211.2	328.6	95.6
51-60	283.7	407.2	43.9
61-70	383.8	539.9	15.5
71-80	473.5	569.9	1.6
81-90	548.2	542.6	2.6
91-100	592.9	636.5	3.4
101-110	597.4	598.2	--
111-120	691.6	588.9	--
121-130	684.2	494.3	--
131-140	540.3	334.7	--
141-150	362.2	236.1	--
151-160	201.9	118.3	--
161+	92.5	69.5	--
All classes	5,975.5	5,975.5	5,975.5

(Table 38 continued on next page)

(Table 38 continued)

Stocking class (percent)	Stocking classified in terms of: All live trees	Growing-stock trees	Rough and rotten trees
Central Hardwood Unit			
0-10	16.3	32.0	692.1
11-20	10.3	50.9	586.2
21-30	33.7	77.0	394.2
31-40	47.9	139.5	264.4
41-50	77.4	207.9	168.4
51-60	152.8	251.1	91.3
61-70	174.4	314.3	40.7
71-80	183.6	318.4	18.6
81-90	251.5	266.6	8.2
91-100	281.4	192.8	4.3
101-110	299.6	164.7	3.6
111-120	290.7	137.8	2.6
121-130	190.8	52.9	--
131-140	156.3	32.6	--
141-150	71.2	20.7	0.8
151-160	24.4	9.6	--
161+	13.1	6.6	--
All classes	2,275.4	2,275.4	2,275.4
Prairie Unit			
0-10	4.0	11.2	179.3
11-20	5.6	15.7	125.0
21-30	7.0	15.2	99.4
31-40	10.1	38.3	94.2
41-50	14.9	63.4	67.8
51-60	29.8	64.6	27.9
61-70	37.3	69.5	22.0
71-80	49.0	73.0	19.2
81-90	46.8	72.1	2.4
91-100	63.9	73.0	2.4
101-110	73.1	44.7	2.0
111-120	93.6	38.7	2.2
121-130	82.1	20.1	--
131-140	68.1	20.4	--
141-150	39.5	15.8	--
151-160	16.3	6.9	--
161+	2.7	1.2	--
All classes	643.8	643.8	643.8

Table 39.--Area of timberland in plantations by forest type, stand-age class, and Forest Survey Unit, Minnesota, 1990

(In thousand acres)

Unit and forest type	All classes	Stand-age class (years) 1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81+
All Units										
Jack pine	58.8	14.4	12.8	9.2	10.2	6.0	3.6	2.6	--	- -
Red pine	129.5	20.7	34.1	35.2	22.2	8.8	4.7	1.3	2.5	- -
White pine	2.2	--	1.2	--	--	--	--	1.0	--	- -
Balsam fir	12.8	9.2	3.2	--	--	0.4	--	--	--	- -
White spruce	25.4	8.6	3.3	10.2	1.0	2.3	--	--	--	- -
Black spruce	2.6	--	1.4	1.2	--	--	--	--	--	- -
Northern white-cedar	4.0	--	--	--	--	--	--	--	1.9	2.1
Tamarack	1.2	1.2	--	--	--	--	--	--	--	- -
Oak-hickory	19.1	12.0	1.8	--	0.6	--	--	--	--	4.7
Elm-ash-soft maple	1.6	1.6	--	--	--	--	--	--	--	- -
Maple-basswood	14.1	9.2	3.7	0.9	--	0.3	--	--	--	- -
Aspen	64.0	40.7	13.8	3.8	3.7	0.9	1.1	--	--	- -
Paper birch	11.8	8.8	1.8	1.2	--	--	--	--	--	- -
Balsam poplar	3.0	1.7	1.3	--	--	--	--	--	--	- -
Nonstocked	4.1	3.3	0.8	--	--	--	--	--	--	- -
All types	354.2	131.4	79.2	61.7	37.7	18.7	9.4	4.9	4.4	6.8
Aspen-Birch Unit										
Jack pine	19.0	6.3	6.8	2.0	1.5	2.4	--	--	--	- -
Red pine	44.1	9.0	8.2	8.0	10.5	4.7	1.4	1.3	1.0	- -
White pine	--	--	--	--	--	--	--	--	--	- -
Balsam fir	10.7	9.2	1.1	--	--	0.4	--	--	--	- -
White spruce	13.3	3.9	0.8	5.3	1.0	2.3	--	--	--	- -
Black spruce	1.2	--	--	1.2	--	--	--	--	--	- -
Northern white-cedar	4.0	--	--	--	--	--	--	--	1.9	2.1
Tamarack	--	--	--	--	--	--	--	--	--	- -
Oak-hickory	--	--	--	--	--	--	--	--	--	- -
Elm-ash-soft maple	--	--	--	--	--	--	--	--	--	- -
Maple-basswood	6.0	4.4	1.6	--	--	--	--	--	--	- -
Aspen	18.8	13.8	3.5	1.5	--	--	--	--	--	- -
Paper birch	7.3	6.1	1.2	--	--	--	--	--	--	- -
Balsam poplar	--	--	--	--	--	--	--	--	--	- -
Nonstocked	--	--	--	--	--	--	--	--	--	- -
All types	124.4	52.7	23.2	18.0	13.0	9.8	1.4	1.3	2.9	2.1
Northern Pine Unit										
Jack pine	34.6	8.1	6.0	5.4	6.1	2.8	3.6	2.6	--	- -
Red pine	76.9	11.7	25.9	22.6	10.0	2.5	2.7	--	1.5	- -
White pine	1.2	--	1.2	--	--	--	--	--	--	- -
Balsam fir	1.0	--	1.0	--	--	--	--	--	--	- -
White spruce	11.9	4.7	2.5	4.7	--	--	--	--	--	- -
Black spruce	1.4	--	1.4	--	--	--	--	--	--	- -
Northern white-cedar	--	--	--	--	--	--	--	--	--	- -
Tamarack	1.2	1.2	--	--	--	--	--	--	--	- -
Oak-hickory	12.7	10.9	1.8	--	--	--	--	--	--	- -
Elm-ash-soft maple	1.6	1.6	--	--	--	--	--	--	--	- -
Maple-basswood	5.7	4.8	--	0.9	--	--	--	--	--	- -
Aspen	40.9	24.1	10.3	2.3	2.2	0.9	1.1	--	--	- -
Paper birch	3.9	2.7	--	1.2	--	--	--	--	--	- -
Balsam poplar	3.0	1.7	1.3	--	--	--	--	--	--	- -
Nonstocked	3.0	2.2	0.8	--	--	--	--	--	--	- -
All types	199.0	73.7	52.2	37.1	18.3	6.2	7.4	2.6	1.5	- -

(Table 39 continued on next page)

(Table 39 continued)

Unit and forest type	All classes	Stand-age class (years) 1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81+
Central Hardwood Unit										
Jack pine	5.2	--	--	1.8	2.6	0.8	--	--	--	- -
Red pine	8.5	--	--	4.6	1.7	1.6	0.6	--	--	- -
White pine	--	--	--	--	--	--	--	--	--	- -
Balsam fir	1.1	--	1.1	--	--	--	--	--	--	- -
White spruce	0.2	--	--	0.2	--	--	--	--	--	- -
Black spruce	--	--	--	--	--	--	--	--	--	- -
Northern white-cedar	--	--	--	--	--	--	--	--	--	- -
Tamarack	--	--	--	--	--	--	--	--	--	- -
Oak-hickory	6.4	1.1	--	--	0.6	--	--	--	--	4.7
Elm-ash-soft maple	--	--	--	--	--	--	--	--	--	- -
Maple-basswood	2.4	--	2.1	--	--	0.3	--	--	--	- -
Aspen	4.3	2.8	--	--	1.5	--	--	--	--	- -
Paper birch	0.6	--	0.6	--	--	--	--	--	--	- -
Balsam poplar	--	--	--	--	--	--	--	--	--	- -
Nonstocked	1.1	1.1	--	--	--	--	--	--	--	- -
All types	29.8	5.0	3.8	6.6	6.4	2.7	0.6	--	--	4.7
Prairie Unit										
Jack pine	--	--	--	--	--	--	--	--	--	- -
Red pine	--	--	--	--	--	--	--	--	--	- -
White pine	1.0	--	--	--	--	--	--	1.0	--	- -
Balsam fir	--	--	--	--	--	--	--	--	--	- -
White spruce	--	--	--	--	--	--	--	--	--	- -
Black spruce	--	--	--	--	--	--	--	--	--	- -
Northern white-cedar	--	--	--	--	--	--	--	--	--	- -
Tamarack	--	--	--	--	--	--	--	--	--	- -
Oak-hickory	--	--	--	--	--	--	--	--	--	- -
Elm-ash-soft maple	--	--	--	--	--	--	--	--	--	- -
Maple-basswood	--	--	--	--	--	--	--	--	--	- -
Aspen	--	--	--	--	--	--	--	--	--	- -
Paper birch	--	--	--	--	--	--	--	--	--	- -
Balsam poplar	--	--	--	--	--	--	--	--	--	- -
Nonstocked	--	--	--	--	--	--	--	--	--	- -
All types	1.0	--	--	--	--	--	--	1.0	--	- -

Table 40.--Area of reserved forest land by ownership class and Forest Survey Unit, Minnesota, 1990

(In thousand acres)

Ownership class	All Units	Forest Survey Unit			
		Aspen-Birch	Northern Pine	Central Hardwoods	Prairie
National forest	764.2	761.2	3.0	--	--
Miscellaneous federal	109.7	109.7	--	--	--
State	162.6	77.2	25.7	54.9	4.8
County and municipal	27.0	19.3	3.3	4.4	--
Indian	1.3	1.3	--	--	--
Forest industry	1.8	1.8	--	--	--
Farmer	6.4	--	0.8	4.9	0.7
Misc. private corporation	2.5	--	--	2.5	--
Misc. private individual	10.2	4.7	1.3	2.1	2.1
All owners	1,085.7	975.2	34.1	68.8	7.6

Table 41.--Area of reserved forest land by forest type and Forest Survey Unit, Minnesota, 1990

(In thousand acres)

Forest type	All Units	Forest Survey Unit			
		Aspen-Birch	Northern Pine	Central Hardwoods	Prairie
Jack pine	133.0	132.2	--	0.8	--
Red pine	81.7	78.8	2.9	--	--
White pine	3.8	3.8	--	--	--
Balsam fir	93.1	90.7	--	2.4	--
White spruce	39.9	39.9	--	--	--
Black spruce	103.7	92.1	10.6	1.0	--
Northern white-cedar	23.0	22.5	0.5	--	--
Tamarack	5.8	5.8	--	--	--
Oak-hickory	8.7	--	--	8.7	--
Elm-ash-soft maple	42.8	20.5	0.6	16.9	4.8
Maple-basswood	17.5	5.4	6.0	6.1	--
Aspen	430.7	381.5	13.5	32.9	2.8
Paper birch	94.9	94.9	--	--	--
Balsam poplar	7.1	7.1	--	--	--
All types	1,085.7	975.2	34.1	68.8	7.6

Table 42.--Net volume of growing stock on timberland by species group and Forest Survey Unit, Minnesota, 1977 and 1990

(In thousand cubic feet)

Species group	All Units		Aspen-Birch Unit		Northern Pine Unit		Central Hardwoods Unit		Prairie Unit	
	1977	1990	1977	1990	1977	1990	1977	1990	1977	1990
Softwoods										
Jack pine	494,834	550,139	134,674	167,032	348,802	369,013	11,026	13,908	332	186
Red pine	403,014	581,621	173,593	180,684	213,792	355,600	15,097	44,681	532	656
White pine	208,300	261,642	112,690	127,938	80,877	110,473	14,733	22,429	--	802
White spruce	202,496	295,108	147,010	204,409	52,879	85,755	2,121	4,265	486	679
Black spruce	594,723	745,825	461,629	560,964	127,386	174,799	5,501	9,190	207	872
Balsam fir	884,012	961,739	558,929	621,636	317,724	326,440	7,243	13,245	116	418
Tamarack	294,057	475,035	94,094	178,164	169,512	257,928	29,975	36,620	476	2,323
Eastern redcedar	4,963	14,956	65	275	244	421	3,236	9,330	1,418	4,930
Northern white-cedar	494,190	744,235	305,967	480,498	188,223	263,737	--	--	--	--
Other softwoods	1,462	3,743	97	84	--	215	1,365	3,444	--	--
Total	3,582,051	4,634,043	1,988,748	2,521,684	1,499,439	1,944,381	90,297	157,112	3,567	10,866
Hardwoods										
Select white oak	458,333	645,287	5,921	9,776	149,517	223,365	220,640	295,784	82,255	116,362
Select red oak	667,321	816,814	10,834	12,388	253,794	301,937	382,792	475,478	19,901	27,011
Other red oak	19,940	36,745	--	128	1,840	5,716	17,408	29,755	692	1,146
Hickory	17,009	26,161	--	--	529	620	16,050	23,951	430	1,590
Basswood	498,092	691,130	36,450	49,643	250,536	360,881	171,833	215,909	39,273	64,697
Yellow birch	16,019	21,843	9,789	14,237	5,594	7,125	636	270	--	211
Hard maple	287,342	402,997	69,003	116,363	128,609	183,183	78,081	89,881	11,649	13,570
Soft maple	176,977	344,111	38,536	102,253	77,772	135,302	56,086	98,223	4,583	8,333
Elm	541,677	268,083	52,374	18,739	199,092	121,041	217,802	98,853	72,409	29,450
Black ash	494,967	699,328	186,395	258,256	241,285	342,998	61,980	91,156	5,307	6,918
White and green ash	113,536	186,502	6,193	8,887	26,850	44,421	52,067	78,245	28,426	54,949
Cottonwood	27,494	52,385	417	762	85	156	13,181	21,623	13,811	29,844
Willow	22,277	29,374	--	174	80	173	8,359	10,075	13,838	18,952
Hackberry	5,191	9,885	--	--	--	--	3,042	5,741	2,149	4,144
Balsam poplar	596,928	594,094	242,067	243,228	310,074	303,463	14,462	16,904	30,325	30,499
Bigtooth aspen	215,647	278,351	39,958	43,309	132,076	167,202	43,575	67,268	38	572
Quaking aspen	3,236,084	3,809,323	1,214,778	1,504,046	1,634,498	1,814,162	278,056	370,404	108,752	120,711
Paper birch	1,344,224	1,454,841	642,782	706,851	583,930	621,468	114,333	123,985	3,179	2,537
River birch	92	37	--	--	--	--	92	37	--	--
Black cherry	12,445	15,684	78	314	1,227	1,553	9,955	12,913	1,185	904
Black walnut	8,199	14,163	--	--	--	--	6,650	11,522	1,549	2,641
Butternut	8,804	11,145	--	--	1,829	1,721	6,855	8,822	120	602
Other hardwoods	28,690	51,649	90	861	2,037	4,904	13,521	27,019	13,042	18,865
Total	8,797,288	10,459,932	2,555,665	3,090,215	4,001,254	4,641,391	1,787,456	2,173,818	452,913	554,508
All species	12,379,339	15,093,975	4,544,413	5,611,899	5,500,693	6,585,772	1,877,753	2,330,930	456,480	565,374

Table 43.--Net volume of sawtimber on timberland by species group and Forest Survey Unit, Minnesota, 1977 and 1990

(In thousand board feet) [1]

Species group	All Units		Aspen-Birch Unit		Northern Pine Unit		Central Hardwoods Unit		Prairie Unit	
	1977	1990	1977	1990	1977	1990	1977	1990	1977	1990
Softwoods										
Jack pine	1,383,295	1,698,838	435,624	576,837	920,023	1,080,395	26,367	40,686	1,281	920
Red pine	1,797,329	2,429,466	739,321	785,692	1,012,480	1,537,249	42,563	102,823	2,965	3,702
White pine	1,001,053	1,287,412	548,094	648,619	380,599	526,245	72,360	109,036	--	3,512
White spruce	781,381	1,147,695	573,447	808,133	196,415	318,941	9,193	16,945	2,326	3,676
Black spruce	505,488	709,109	390,068	540,302	113,011	165,963	2,409	2,844	--	--
Balsam fir	1,376,996	1,854,099	789,816	1,129,014	577,628	697,736	9,552	27,349	--	--
Tamarack	404,834	833,890	116,350	335,588	229,446	412,740	58,486	83,830	552	1,732
Eastern redcedar	6,777	29,531	--	--	--	--	4,276	18,868	2,501	10,663
Northern white-cedar	1,336,476	2,191,719	878,400	1,498,124	458,076	693,595	--	--	--	--
Other softwoods	3,413	8,140	480	430	--	403	2,933	7,307	--	--
Total	8,597,042	12,189,899	4,471,600	6,322,739	3,887,678	5,433,267	228,139	409,688	9,625	24,205
Hardwoods										
Select white oak	1,193,308	1,819,363	14,191	28,445	266,761	419,962	642,240	934,179	270,116	436,777
Select red	1,878,557	2,632,750	23,672	38,380	484,026	777,287	1,298,697	1,708,405	72,162	108,678
Other red oak	69,326	123,672	--	528	3,123	12,450	63,124	104,993	3,079	5,701
Hickory	29,872	50,375	--	--	371	363	28,498	46,553	1,003	50,012
Basswood	1,216,132	1,820,693	68,131	133,826	460,899	789,982	521,730	627,064	165,372	269,821
Yellow birch	57,793	72,693	41,613	50,134	14,936	21,596	1,244	963	--	--
Hard maple	660,642	803,435	108,755	154,930	300,784	374,332	216,169	233,654	34,934	40,519
Soft maple	272,273	502,432	22,938	72,128	88,637	166,276	143,633	228,327	17,065	35,701
Elm	1,569,099	635,878	155,589	60,330	452,942	253,297	678,533	238,072	282,035	84,179
Black ash	600,817	966,959	209,522	323,146	302,096	491,051	85,279	147,017	3,920	5,745
White and green ash	237,477	484,770	6,004	19,270	33,168	86,493	114,910	206,614	83,395	172,393
Cottonwood	128,243	235,374	884	1,829	--	466	64,129	100,839	63,230	132,240
Willow	61,301	95,126	--	698	--	343	29,003	35,930	32,298	58,155
Hackberry	14,157	23,940	--	--	--	--	7,443	12,229	6,714	11,711
Balsam poplar	1,039,102	1,155,227	415,479	502,247	573,689	583,972	18,514	32,620	31,420	36,388
Bigtooth aspen	391,526	748,265	77,096	89,046	235,073	486,511	79,357	172,392	--	316
Quaking aspen	5,222,003	8,631,429	1,981,284	3,319,888	2,790,533	4,446,866	379,069	721,339	71,117	143,336
Paper birch	1,088,816	1,622,177	516,988	772,195	501,834	732,924	66,984	114,623	3,010	2,435
Black cherry	19,349	26,808	--	--	--	--	17,164	24,760	2,185	2,048
Black walnut	26,571	46,779	--	--	--	--	22,584	39,088	3,987	7,691
Butternut	22,159	33,328	--	--	3,255	3,589	18,272	28,088	632	1,651
Other hardwoods	45,694	89,095	--	139	3,770	3,754	20,191	49,624	21,733	35,578
Total	15,844,217	22,620,568	3,642,146	5,567,159	6,515,897	9,651,514	4,516,767	5,807,373	1,169,407	1,594,522
All species	24,441,259	34,810,467	8,113,746	11,889,898	10,403,575	15,084,781	4,744,906	6,217,061	1,179,032	1,618,727

[1] International 1/4-inch rule.

Table 44.--Net volume of all live trees[1] on timberland by species group and diameter class, Minnesota, 1990

(In thousand cubic feet)

Species group	All classes	Diameter class (inches at breast height) 5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods											
Jack pine	569,755	78,482	137,505	148,950	103,181	62,010	24,919	9,861	2,864	1,983	--
Red pine	586,969	56,676	82,499	80,257	75,487	74,981	69,556	59,321	43,703	44,386	103
White pine	273,204	9,982	14,983	20,270	24,871	27,896	24,972	26,392	28,870	73,524	21,444
White spruce	299,025	34,515	47,105	48,572	50,188	37,229	30,987	23,168	15,091	12,170	--
Black spruce	757,662	383,327	237,415	95,181	28,448	6,564	3,978	989	598	1,070	92
Balsam fir	983,531	298,226	296,070	212,207	114,040	40,788	15,122	4,111	1,704	1,263	--
Tamarack	501,996	170,666	154,208	93,749	47,017	21,431	9,880	1,947	2,028	1,070	--
Eastern redcedar	17,610	4,213	6,812	2,445	2,311	748	418	455	--	208	--
Northern white-cedar	883,386	154,886	212,955	191,850	131,457	90,353	50,415	24,728	14,701	11,855	186
Other softwoods	5,068	1,096	1,480	901	447	547	235	--	--	63	299
Total	4,878,206	1,192,069	1,191,032	894,382	577,447	362,547	230,482	150,972	109,559	147,592	22,124
Hardwoods											
Select white oak	849,015	71,729	96,655	118,723	122,181	107,724	94,316	77,226	48,135	90,467	21,859
Select red oak	949,081	34,279	88,026	147,547	150,820	135,073	120,286	89,885	63,483	101,625	18,057
Other red oak	55,937	2,562	6,189	3,810	7,158	6,896	7,405	4,148	5,619	10,528	1,622
Hickory	30,769	3,883	6,173	5,366	5,605	4,546	2,347	1,473	867	509	--
Basswood	774,091	72,774	110,419	144,061	121,018	102,487	74,670	57,135	33,819	50,692	7,016
Yellow birch	35,947	2,437	3,705	4,064	4,370	6,286	3,596	3,629	2,957	4,366	537
Hard maple	534,113	102,136	94,931	78,367	70,444	57,469	49,430	33,713	21,284	24,352	1,987
Soft maple	455,481	122,676	98,436	71,925	40,634	29,887	20,677	15,588	13,451	24,955	17,252
Elm	325,875	45,882	51,775	50,018	46,639	30,801	28,966	19,820	16,478	27,196	8,300
Black ash	746,122	162,465	196,583	158,645	107,013	63,382	30,158	15,249	6,360	5,410	857
White and green ash	227,259	20,847	32,388	40,997	36,603	30,325	21,830	14,663	11,169	14,616	3,821
Cottonwood	56,422	491	1,291	2,775	3,088	2,552	3,832	3,536	4,738	14,429	19,690
Willow	45,458	986	3,147	5,714	6,629	6,474	5,150	5,562	2,720	5,811	3,265
Hackberry	13,746	2,449	1,880	1,812	1,364	1,939	1,199	1,247	498	1,157	201
Balsam poplar	631,822	80,879	128,472	147,946	113,607	76,244	42,697	23,970	9,679	7,872	456
Bigtooth aspen	312,296	17,557	40,048	66,972	76,231	54,353	31,117	16,033	6,580	3,283	122
Quaking aspen	4,273,061	414,759	710,148	947,516	894,407	638,451	372,551	168,294	68,835	56,777	1,323
Paper birch	1,592,065	316,508	454,615	387,619	228,488	114,316	50,696	24,249	7,593	7,330	651
River birch	151	37	--	--	--	--	--	114	--	--	--
Black cherry	26,640	5,224	7,241	5,272	3,549	2,704	1,492	777	322	59	--
Black walnut	16,584	222	2,868	1,789	2,430	2,535	3,006	1,956	919	859	--
Butternut	20,118	491	2,981	2,923	3,664	2,558	2,741	2,633	894	1,032	201
Other hardwoods	131,409	16,440	23,513	24,450	19,091	16,923	10,362	7,145	5,320	6,458	1,707
Noncommercial sp.	32,177	20,211	7,268	2,774	919	434	--	151	--	253	167
Total	12,135,639	1,517,924	2,168,752	2,421,085	2,065,952	1,494,359	978,524	588,196	331,720	460,036	109,091
All species	17,013,845	2,709,993	3,359,784	3,315,467	2,643,399	1,856,906	1,209,006	739,168	441,279	607,628	131,215

[1] Net volume of all live trees 5 inches dbh and larger from a 1-foot stump to a 4-inch top diameter outside bark.

Table 45.--Net volume of tree species on timberland by major tree class and individual species, Minnesota, 1990

Species	Total all live	All live trees				Total saw-log size trees	Saw-log size trees	
		Growing stock	Short-log	Rough	Rotten		Sawtimber	Short-log
	Thousand cubic feet					*Thousand board feet* [1]		
Jack pine	569,755	550,139	3,513	14,872	1,231	1,710,927	1,698,838	12,089
Red pine	586,969	581,621	1,693	3,506	149	2,435,903	2,429,466	6,437
White pine	273,204	261,642	2,167	6,730	2,665	1,294,925	1,287,412	7,513
Ponderosa pine	641	625	--	16	--	123	123	--
White spruce	299,025	295,108	562	2,796	559	1,150,440	1,147,695	2,745
Black spruce	757,662	745,825	445	10,559	833	710,559	709,109	1,450
Balsam fir	983,531	961,739	2,544	16,384	2,864	1,861,315	1,854,099	7,216
Tamarack	501,996	475,035	2,855	19,146	4,960	845,703	833,890	11,813
Eastern redcedar	17,610	14,956	268	2,207	179	30,799	29,531	1,268
Northern white-cedar	883,386	744,235	17,243	70,296	51,612	2,251,916	2,191,719	60,197
Scotch pine	4,128	3,118	180	830	--	8,853	8,017	836
White oak	108,867	80,101	9,365	17,356	2,045	305,458	282,025	23,433
Swamp white oak	725	526	--	199	--	857	857	--
Bur oak	739,423	564,660	51,705	116,464	6,594	1,663,246	1,536,481	126,765
Northern red oak	949,081	816,814	32,220	82,657	17,390	2,702,094	2,632,750	69,344
Northern pin oak	45,856	30,142	3,540	10,502	1,672	103,855	96,043	7,812
Black oak	10,081	6,603	305	2,816	357	28,235	27,629	606
Shagbark hickory	18,954	16,348	858	1,617	131	41,333	39,396	1,937
Bitternut hickory	11,815	9,813	319	1,683	--	11,699	10,979	720
American basswood	774,091	691,130	19,147	47,692	16,122	1,861,091	1,820,693	40,398
Yellow birch	35,947	21,843	1,947	5,681	6,476	77,366	72,693	4,673
Black maple	1,679	455	484	640	100	1,811	723	1,088
Sugar maple	532,434	402,542	17,102	84,090	28,700	841,314	802,712	38,602
Red maple	366,824	275,331	5,592	68,950	16,951	240,390	226,686	13,704
Silver maple	88,657	68,780	6,953	11,169	1,755	294,911	275,746	19,165
American elm	289,468	239,412	12,740	33,536	3,780	597,466	564,848	32,618
Siberian elm	811	362	209	223	17	780	269	511
Slippery elm	32,516	25,502	1,789	4,983	242	70,137	65,484	4,653
Rock elm	3,080	2,807	--	210	63	5,277	5,277	--
Black ash	746,122	699,328	5,544	34,832	6,418	979,549	966,959	12,590
White ash	10,489	7,531	1,325	1,505	128	21,826	18,665	3,161
Green ash	216,770	178,971	8,868	24,208	4,723	485,282	466,105	19,177
Eastern cottonwood	56,422	52,385	1,395	1,755	887	240,610	235,374	5,236
Black willow	45,458	29,374	3,160	10,932	1,992	105,527	95,126	10,401
Hackberry	13,746	9,885	1,420	2,338	103	27,620	23,940	3,680
Balsam poplar	631,822	594,094	3,078	24,232	10,418	1,162,781	1,155,227	7,554
Bigtooth aspen	312,296	278,351	3,359	19,552	11,034	753,810	748,265	5,545
Quaking aspen	4,273,061	3,809,323	49,232	237,795	176,711	8,736,014	8,631,429	104,585
Paper birch	1,592,065	1,454,841	17,806	101,325	18,093	1,663,352	1,622,177	41,175
River birch	151	37	89	--	25	319	--	319
Black cherry	26,640	15,684	723	9,422	811	28,356	26,808	1,548
Black walnut	16,584	14,163	988	1,250	183	49,084	46,779	2,305
Butternut	20,118	11,145	1,397	6,490	1,086	36,610	33,328	3,282
Boxelder	125,113	49,080	6,395	60,659	8,979	101,785	82,730	19,055
Kentucky coffeetree	903	871	--	--	32	1,348	1,348	--
Red mulberry	68	--	--	68	--	--	--	--
Black locust	5,290	1,698	954	2,405	233	7,770	5,017	2,753
Others	334	--	299	--	35	1,981	--	1,981
Noncommercial species	32,177	--	--	32,177	--	--	--	--
All commercial species	17,013,845	15,093,975	301,777	1,208,755	409,338	35,552,407	34,810,467	741,940

[1] International 1/4 -inch rule.

Table 46.--Net volume of noncommercial tree species on timberland by individual species, Minnesota, 1990

(In thousand cubic feet)

Species	Nongrowing-stock volume
Striped maple	115
Mountain maple	121
American hornbeam	1,054
Hawthorn	478
Apple	133
Eastern hophornbeam	12,714
Pincherry	311
Chokecherry	326
Wild plum	194
Mountain ash	379
Peachleaf willow	286
Ailantus	163
Others	15,903
All species	32,177

Table 47.--Net volume of growing stock on timberland by species group and forest type, Minnesota, 1990

(In thousand cubic feet)

Species group	All types	Forest type														
		Jack pine	Red pine	White pine	Balsam fir	White spruce	Black spruce	Northern white-cedar	Tamarack	Oak-hickory	Elm-ash-soft maple	Maple-basswood	Aspen	Paper birch	Balsam poplar	Non-stocked
Softwoods																
Jack pine	550,139	384,610	27,939	2,861	11,026	3,195	21,664	278	1,990	15,278	1,326	3,225	67,019	9,062	666	--
Red pine	581,621	41,877	358,757	14,294	17,298	2,443	5,619	867	2,056	13,119	526	8,793	92,507	21,847	1,618	--
White pine	261,642	7,357	31,436	72,245	21,402	2,551	4,168	4,478	2,756	6,165	2,273	31,157	55,232	19,782	640	--
White spuce	295,108	9,040	8,540	6,323	53,526	47,352	5,261	5,799	1,200	1,885	19,885	13,670	90,093	23,758	8,704	72
Black spruce	745,825	9,338	2,821	1,255	55,462	3,599	519,577	50,775	42,737	--	6,388	1,450	43,369	7,140	1,900	14
Balsam fir	961,739	12,575	13,499	5,757	283,483	8,232	34,547	46,670	8,194	1,033	60,649	34,786	328,671	94,041	29,602	--
Tamarack	475,035	722	723	104	12,298	108	80,445	28,465	313,006	--	14,384	405	14,948	3,476	4,547	1,404
Eastern redcedar	14,956	--	--	--	--	--	421	--	--	9,580	87	3,614	644	610	--	--
Northern white-cedar	744,235	--	1,138	760	43,992	2,915	16,794	558,572	13,321	--	38,774	15,211	27,069	17,180	8,490	19
Other softwoods	3,743	2,491	--	--	--	135	--	--	--	875	--	--	242	--	--	--
Total	4,634,043	468,010	444,853	103,599	498,487	70,530	688,496	695,904	385,260	47,935	144,292	112,311	719,794	196,896	56,167	1,509
Hardwoods																
Select white oak	645,287	1,592	1,005	552	849	98	--	84	190	384,079	30,534	98,997	116,277	9,930	957	143
Select red oak	816,814	2,945	2,142	601	304	--	289	--	673	534,868	5,003	104,590	134,884	29,094	1,421	--
Other red oak	36,745	--	327	--	--	--	--	--	--	29,038	267	2,788	2,998	1,031	296	--
Hickory	26,161	--	--	--	--	--	--	--	--	20,215	334	4,396	248	968	--	--
Basswood	691,130	280	1,168	70	872	--	--	165	98	70,138	41,385	457,918	101,880	15,320	1,836	--
Yellow birch	21,843	--	--	--	494	449	56	2,288	--	217	4,625	11,276	1,102	1,052	284	--
Hard maple	402,997	--	628	310	501	47	74	428	--	20,465	13,431	303,092	46,695	15,913	1,413	--
Soft maple	344,111	1,005	1,029	3,846	4,436	1,090	1,919	462	744	15,824	85,111	78,897	118,736	30,172	840	--
Elm	268,083	--	124	218	927	67	373	74	1,027	41,448	60,354	104,775	45,504	8,992	4,120	80
Black ash	699,328	121	390	150	9,459	405	1,382	24,103	1,772	10,162	456,987	61,284	88,907	23,856	19,720	630
White and green ash	186,502	--	211	244	233	132	--	459	--	18,914	47,031	95,631	20,711	2,208	578	150
Cottonwood	52,385	--	--	--	--	--	97	--	--	5,902	39,090	5,120	1,902	97	--	177
Willow	29,374	--	44	--	--	--	--	--	--	350	25,949	2,283	748	--	--	--
Hackberry	9,885	--	--	--	--	--	--	--	--	3,152	4,171	2,562	--	--	--	--
Balsam poplar	594,094	817	1,692	272	18,411	2,255	2,523	10,622	2,602	3,536	62,267	19,538	218,636	22,803	226,013	2,107
Bigtooth aspen	278,351	3,917	4,722	97	1,406	--	594	698	170	19,454	1,420	18,340	213,927	13,389	217	--
Quaking aspen	3,809,323	39,675	23,257	8,926	99,482	12,801	49,760	16,633	9,692	96,694	75,592	119,265	3,052,386	146,117	57,848	1,195
Paper birch	1,454,841	17,485	22,552	8,619	82,434	7,377	14,935	41,531	5,008	59,698	47,291	123,666	477,160	529,344	17,416	325
River birch	37	--	--	--	--	--	--	--	--	--	37	--	--	--	--	--
Black cherry	15,684	--	--	--	--	--	--	--	--	7,191	895	5,263	1,688	647	--	--
Black walnut	14,163	--	--	--	--	--	--	--	--	9,978	2,610	1,442	39	94	--	--
Butternut	11,145	--	--	--	--	--	--	--	--	7,494	563	1,982	1,011	95	--	--
Other hardwoods	51,649	--	--	--	--	--	64	--	--	7,919	33,084	8,042	2,302	171	67	--
Total	10,459,932	67,837	59,291	23,905	219,808	24,721	72,066	97,547	21,976	1,366,736	1,038,031	1,631,147	4,647,741	851,293	333,026	4,807
All species	15,093,975	535,847	504,144	127,504	718,295	95,251	760,562	793,451	407,236	1,414,671	1,182,323	1,743,458	5,367,535	1,048,189	389,193	6,316

Table 48.--Net volume of sawtimber on timberland by species group and forest type, Minnesota, 1990

(In thousand board feet)[1]

Species group	All types	Forest type														
		Jack pine	Red pine	White pine	Balsam fir	White spruce	Black spruce	Northern white-cedar	Tamarack	Oak-hickory	Elm-ash-soft maple	Maple-basswood	Aspen	Paper birch	Balsam poplar	Non-stocked
Softwoods																
Jack pine	1,698,838	1,113,858	78,740	9,028	43,246	9,521	66,159	1,376	4,640	58,545	5,761	12,279	253,808	39,901	1,976	--
Red pine	2,429,466	185,718	1,396,725	64,812	81,164	11,250	25,104	4,706	8,031	60,379	2,820	39,713	442,797	102,080	4,167	--
White pine	1,287,412	30,661	137,712	354,418	114,951	11,312	18,879	24,827	13,272	25,992	12,253	167,609	273,323	98,847	3,356	--
White spruce	1,147,695	31,026	23,474	25,772	201,255	144,609	22,792	25,706	1,373	9,351	92,612	67,707	352,775	106,447	42,410	386
Black spruce	709,109	8,264	3,586	3,066	82,563	7,539	374,039	79,235	32,065	--	15,899	1,752	78,218	16,791	6,014	78
Balsam fir	1,854,099	17,386	28,321	6,291	496,461	17,196	55,975	59,845	14,612	2,697	131,219	80,839	696,641	179,999	66,617	--
Tamarack	833,890	2,315	1,948	--	29,409	540	120,800	68,672	482,563	--	53,109	1,641	43,533	10,444	14,926	3,990
Eastern redcedar	29,531	--	--	--	--	--	--	--	--	20,365	437	7,836	--	893	--	--
Northern white-cedar	2,191,719	--	1,822	1,860	165,668	12,088	34,565	1,532,816	33,190	--	141,968	70,519	96,143	66,106	34,873	101
Other softwoods	8,140	3,257	--	--	--	--	--	--	--	4,012	--	--	871	--	--	--
Total	12,189,899	1,392,485	1,672,328	465,247	1,214,717	214,055	718,313	1,797,183	589,746	181,341	456,078	449,895	2,238,109	621,508	174,339	4,555
Hardwoods																
Select white oak	1,819,363	1,756	547	1,923	2,424	--	--	384	--	1,184,932	80,531	313,443	215,316	15,790	1,615	702
Select red oak	2,632,750	5,520	3,299	1,940	892	--	895	--	2,181	1,800,503	12,163	379,243	345,806	74,291	6,017	--
Other red oak	123,672	--	847	--	--	--	--	--	--	95,898	332	12,593	7,839	4,701	1,462	--
Hickory	50,375	--	--	--	--	--	--	--	--	37,902	--	8,176	706	3,591	--	--
Basswood	1,820,693	--	--	328	3,277	--	--	795	275	178,857	131,551	1,304,004	164,085	35,449	2,072	--
Yellow birch	72,693	--	--	--	1,078	1,202	275	9,245	--	--	16,348	41,292	1,656	1,597	--	--
Hard maple	803,435	--	--	444	826	--	--	279	--	33,685	31,435	683,833	40,660	10,508	1,765	--
Soft maple	502,432	--	--	4,545	3,432	558	3,315	467	1,270	18,235	275,535	122,062	59,535	12,642	836	--
Elm	635,878	--	--	985	2,239	--	510	--	732	87,873	160,067	270,038	87,042	18,896	7,496	--
Black ash	966,959	--	--	369	6,543	324	--	24,119	1,212	13,392	672,185	103,628	89,042	29,942	25,789	414
White and green ash	484,770	--	1,008	822	--	--	--	1,390	--	46,486	132,702	271,357	25,498	3,930	866	711
Cottonwood	235,374	--	--	--	--	--	--	--	--	26,963	175,140	24,556	8,308	407	--	--
Willow	95,126	--	--	--	--	--	--	--	--	--	85,095	7,068	2,963	--	--	--
Hackberry	23,940	--	--	--	--	--	--	--	--	5,196	10,996	7,748	--	--	--	--
Balsam poplar	1,155,227	--	3,378	327	36,469	5,506	3,171	29,593	2,518	5,542	153,820	45,358	371,254	55,529	440,683	2,079
Bigtooth aspen	748,265	4,472	12,760	447	3,292	--	--	540	852	58,956	5,326	57,634	557,589	46,397	--	--
Quaking aspen	8,631,429	61,625	45,842	24,662	216,821	30,620	84,065	46,851	28,780	220,038	209,205	348,188	6,792,039	391,973	130,293	427
Paper birch	1,622,177	16,327	13,410	7,808	98,501	11,850	8,903	58,568	5,654	64,885	72,121	230,238	466,961	539,513	26,974	464
Black cherry	26,808	--	--	--	--	--	--	--	--	12,555	2,343	11,510	400	--	--	--
Black walnut	46,779	--	--	--	--	--	--	--	--	35,140	5,583	5,421	196	439	--	--
Butternut	33,328	--	--	--	--	--	--	--	--	23,839	1,634	5,686	1,703	466	--	--
Other hardwoods	89,095	--	--	--	--	--	--	--	--	14,195	63,546	11,354	--	--	--	--
Total	22,620,568	89,700	81,091	44,600	375,794	50,060	101,134	172,231	43,474	3,965,072	2,297,658	4,264,430	9,238,598	1,246,061	645,868	4,797
All species	34,810,467	1,482,185	1,753,419	509,847	1,590,511	264,115	819,447	1,969,414	633,220	4,146,413	2,753,736	4,714,325	11,476,707	1,867,569	820,207	9,352

[1] International 1/4-inch rule

Table 49.--Net volume of growing stock on timberland by species group and ownership class, Minnesota, 1990

(In thousand cubic feet)

Species group	All owners	Ownership class									
		National forest	Bureau of Land Mgmt.	Misc. federal	State	County & municipal	Indian	Forest industry	Farmer	Misc. private corporation	Misc. private individual
Softwoods											
Jack pine	550,139	109,338	3,999	4,196	93,808	92,390	9,912	45,863	43,429	11,114	136,090
Red pine	581,621	198,462	1,766	8,616	92,241	86,059	20,684	29,597	26,237	11,524	106,435
White pine	261,642	79,468	--	4,934	24,569	36,576	15,041	10,652	20,141	13,828	56,433
White spruce	295,108	76,713	983	1,907	53,563	55,318	7,938	22,142	14,901	10,002	51,641
Black spruce	745,825	179,486	2,331	5,412	282,736	103,971	22,055	39,947	17,154	27,209	65,524
Balsam fir	961,739	179,149	386	4,206	180,827	238,575	25,564	75,181	48,293	52,618	156,940
Tamarack	475,035	37,742	627	5,041	205,431	67,589	29,691	8,347	37,007	11,340	72,220
Eastern redcedar	14,956	--	--	--	961	275	--	--	10,069	--	3,651
Northern white-cedar	744,235	117,912	2,803	7,304	285,257	109,173	69,818	69,061	13,260	19,376	50,271
Other softwoods	3,743	--	--	--	8	--	--	--	808	761	2,166
Total	4,634,043	978,270	12,895	41,616	1,219,401	789,926	200,703	300,790	231,299	157,772	701,371
Hardwoods											
Select white oak	645,287	11,649	88	12,255	43,852	35,977	14,689	2,763	326,454	18,388	179,172
Other white oak	816,814	14,331	--	23,583	97,285	93,180	9,201	3,876	304,606	30,443	240,309
Select red oak	36,745	572	--	1,904	2,728	3,418	64	--	17,916	1,182	8,961
Hickory	26,161	--	--	407	1,232	85	87	--	17,347	611	6,392
Basswood	691,130	48,840	--	13,240	66,195	113,351	23,813	18,495	192,817	22,118	192,261
Yellow birch	21,843	7,049	--	--	1,573	6,727	--	664	465	1,224	4,141
Hard maple	402,997	53,032	199	5,750	53,167	90,858	10,156	13,582	69,667	14,109	92,477
Soft maple	344,111	37,713	--	26,810	46,606	68,191	5,147	13,144	40,216	19,415	86,869
Elm	268,083	3,390	388	9,054	25,339	30,736	10,265	2,583	112,130	8,770	65,428
Black ash	699,328	35,197	1,296	5,762	117,156	155,669	23,417	38,813	94,690	24,167	203,161
White and green ash	186,502	4,518	457	8,132	17,846	11,784	3,874	2,337	82,709	7,963	46,882
Cottonwood	52,385	97	--	7,522	4,671	1,479	--	--	27,602	2,320	8,694
Willow	29,374	--	--	1,761	268	299	--	86	14,657	166	12,137
Hackberry	9,885	--	--	290	260	--	--	--	5,573	393	3,369
Balsam poplar	594,094	48,448	1,155	5,358	131,618	126,174	29,951	36,212	91,587	16,638	106,953
Bigtooth aspen	278,351	35,217	111	1,086	37,624	53,934	5,769	6,238	33,003	10,215	95,154
Quaking aspen	3,809,323	549,848	4,808	38,573	632,300	800,507	155,369	164,595	414,273	161,848	887,202
Paper birch	1,454,841	273,099	322	12,855	199,669	339,305	45,957	64,640	113,045	87,266	318,683
River birch	37	--	--	37	--	--	--	--	--	--	--
Black cherry	15,684	--	--	147	716	750	--	--	10,079	641	3,351
Black walnut	14,163	--	--	--	1,420	39	--	--	8,942	998	2,764
Butternut	11,145	--	--	195	1,071	--	--	169	6,069	455	3,186
Other hardwoods	51,649	--	--	1,131	5,677	1,496	--	261	33,616	1,326	8,142
Total	10,459,932	1,123,000	8,824	175,852	1,488,273	1,933,959	337,759	368,458	2,017,463	430,656	2,575,688
All species	15,093,975	2,101,270	21,719	217,468	2,707,674	2,723,885	538,462	669,248	2,248,762	588,428	3,277,059

Table 50.--Net volume of sawtimber on timberland by species group and ownership class, Minnesota, 1990

(In thousand board feet)[1]

Species group	All owners	Ownership class									
		National forest	Bureau of Land Mgmt.	Misc. federal	State	County & municipal	Indian	Forest industry	Farmer	Misc. private corporation	Misc. private individual
Softwoods											
Jack pine	1,698,838	352,544	14,580	17,717	308,056	292,404	23,646	99,029	126,203	41,063	423,596
Red pine	2,429,466	861,948	5,968	38,466	361,176	393,128	105,458	114,531	101,701	53,069	394,021
White pine	1,287,412	405,599	--	23,362	117,498	180,168	65,868	52,674	97,487	66,693	278,063
White spruce	1,147,695	274,357	4,013	8,556	198,367	224,887	33,146	82,256	67,624	45,619	208,870
Black spruce	709,109	194,271	1,459	4,273	251,525	89,703	12,366	46,820	16,781	30,665	61,246
Balsam fir	1,854,099	295,208	820	12,079	316,907	486,797	47,631	129,552	108,937	96,136	360,032
Tamarack	833,890	71,986	1,574	11,303	296,179	104,849	56,473	15,044	89,984	24,638	161,860
Eastern redcedar	29,531	--	--	--	--	--	--	--	23,276	--	6,255
Northern white-cedar	2,191,719	443,020	3,924	12,432	730,440	347,954	161,806	235,170	36,911	73,740	146,322
Other softwoods	8,140	--	--	--	--	--	--	--	3,533	--	4,607
Total	12,189,899	2,898,933	32,338	128,188	2,580,148	2,119,890	506,394	775,076	672,437	431,623	2,044,872
Hardwoods											
Select white oak	1,819,363	17,039	214	32,878	111,333	70,619	25,130	2,856	1,068,992	47,264	443,038
Other white oak	2,632,750	24,851	--	67,426	311,109	251,413	24,592	5,391	1,132,234	94,444	721,290
Select red oak	123,672	2,106	--	2,650	9,437	5,068	298	--	69,562	5,221	29,330
Hickory	50,375	--	--	812	2,406	363	319	--	34,438	808	11,229
Basswood	1,820,693	119,644	--	30,379	171,267	242,080	60,474	48,152	592,884	59,500	496,313
Yellow birch	72,693	25,467	--	--	5,571	22,307	--	1,866	605	4,796	12,081
Hard maple	803,435	127,255	--	10,512	104,559	153,533	17,738	23,424	177,434	19,524	169,456
Soft maple	502,432	22,863	--	109,667	51,813	65,018	1,325	11,270	81,303	34,748	124,425
Elm	635,878	6,583	1,080	20,456	62,129	61,318	18,499	6,097	280,833	21,227	157,656
Black ash	966,959	47,875	2,162	11,236	135,634	206,262	27,549	63,899	165,904	21,807	284,631
White and green ash	484,770	7,556	656	27,573	45,686	26,257	8,134	5,005	225,750	23,021	115,132
Cottonwood	235,374	--	--	29,940	22,454	5,215	--	--	128,517	10,563	38,685
Willow	95,126	--	--	5,898	857	658	--	343	48,553	600	38,217
Hackberry	23,940	--	--	--	--	--	--	--	12,802	894	10,244
Balsam poplar	1,155,227	118,993	623	9,430	234,596	289,137	35,606	79,854	177,992	29,390	179,606
Bigtooth aspen	748,265	84,491	507	3,427	95,279	147,496	13,484	18,142	92,943	28,207	264,289
Quaking aspen	8,631,429	1,423,054	17,797	95,593	1,293,452	1,953,170	377,073	349,534	797,382	380,583	1,943,791
Paper birch	1,622,177	317,186	1,021	19,688	219,340	332,510	66,530	78,807	131,938	81,718	373,439
Black cherry	26,808	--	--	--	--	239	--	--	22,224	1,508	2,837
Black walnut	46,779	--	--	--	5,269	189	--	--	31,351	3,802	6,168
Butternut	33,328	--	--	988	2,416	--	--	837	20,266	1,972	6,849
Other hardwoods	89,095	--	--	2,062	8,206	784	--	--	56,898	3,765	17,380
Total	22,620,568	2,344,963	24,060	480,615	2,892,813	3,833,636	676,751	695,477	5,350,805	875,362	5,446,086
All species	34,810,467	5,243,896	56,398	608,803	5,472,961	5,953,526	1,183,145	1,470,553	6,023,242	1,306,985	7,490,958

[1] International 1/4-inch rule

Table 51.--Net volume of growing stock on timberland by forest type, stand-age class, and Forest Survey Unit, Minnesota, 1990

(In thousand cubic feet)

Unit and forest type	All classes	Stand-age class (years) 1-20	21-40	41-60	61-80	81-100	101-120	121-140	141+
All Units									
Jack pine	535,847	12,098	89,171	236,706	157,681	30,122	8,571	1,498	--
Red pine	504,144	20,834	112,534	125,689	119,089	81,471	37,050	6,751	726
White pine	127,504	3,464	3,126	11,746	50,146	22,797	31,475	4,750	--
Balsam fir	718,295	49,123	84,845	336,199	180,664	56,745	10,308	411	--
White spruce	95,251	4,817	20,008	36,271	20,613	12,685	--	857	--
Black spruce	760,562	30,410	108,054	215,325	232,810	112,801	37,052	11,247	12,863
Northern white-cedar	793,451	6,250	28,401	46,553	152,640	199,839	119,304	111,127	129,337
Tamarack	407,236	23,043	53,202	81,462	100,933	79,797	22,106	31,658	15,035
Oak-hickory	1,414,671	22,643	48,805	382,592	460,055	326,782	154,083	17,241	2,470
Elm-ash-soft maple	1,182,323	84,991	88,419	276,066	380,348	202,965	77,567	41,942	30,025
Maple-basswood	1,743,458	82,494	96,439	512,432	562,484	335,139	123,433	22,011	9,026
Aspen	5,367,535	414,196	897,740	2,340,843	1,432,737	233,976	37,277	7,955	2,811
Paper birch	1,048,189	31,295	81,857	444,140	380,132	79,313	9,831	19,803	1,818
Balsam poplar	389,193	35,612	51,993	181,096	89,607	25,662	2,896	1,599	728
Nonstocked	6,316	4,094	218	943	1,061	--	--	--	--
All types	15,093,975	825,364	1,764,812	5,228,063	4,321,000	1,800,094	670,953	278,850	204,839
Aspen-birch									
Jack pine	159,126	3,407	19,991	52,462	56,534	16,663	8,571	1,498	--
Red pine	192,464	6,037	35,470	43,005	53,934	40,849	8,106	4,337	726
White pine	65,329	2,366	362	672	21,813	12,941	27,175	--	--
Balsam fir	516,553	39,492	66,610	236,650	120,895	42,187	10,308	411	--
White spruce	67,840	4,271	12,292	30,470	12,954	6,996	--	857	--
Black spruce	563,826	20,173	78,238	155,857	177,264	84,713	28,244	9,116	10,221
Northern white-cedar	507,296	4,174	19,700	23,527	89,984	121,533	77,073	76,885	94,420
Tamarack	137,220	9,899	19,359	27,803	31,215	26,542	4,121	11,204	7,077
Oak-hickory	8,018	1,399	--	1,518	2,141	2,960	--	--	--
Elm-ash-soft maple	349,615	32,768	19,254	67,593	93,559	80,365	27,717	12,516	15,843
Maple-basswood	293,336	15,702	19,673	95,741	59,609	64,403	24,803	10,808	2,597
Aspen	2,008,901	160,271	345,459	784,540	585,822	105,148	19,049	5,801	2,811
Paper birch	561,198	16,230	40,467	223,007	214,959	49,280	8,597	8,658	--
Balsam poplar	178,379	15,125	13,574	79,331	50,013	16,163	1,846	1,599	728
Nonstocked	2,798	2,331	--	131	336	--	--	--	--
All types	5,611,899	333,645	690,449	1,822,307	1,571,032	670,743	245,610	143,690	134,423

(Table 51 continued on next page)

(Table 51 continued)

Unit and forest type	All classes	Stand-age class (years) 1-20	21-40	41-60	61-80	81-100	101-120	121-140	141+
Northern pine									
Jack pine	359,706	7,290	63,607	174,203	101,147	13,459	--	--	--
Red pine	282,014	14,797	57,534	73,778	65,155	39,392	28,944	2,414	--
White pine	50,145	1,098	2,764	6,776	27,039	3,418	4,300	4,750	--
Balsam fir	194,674	8,750	18,235	94,299	58,832	14,558	--	--	--
White spruce	27,343	546	7,648	5,801	7,659	5,689	--	--	--
Black spruce	179,683	8,126	26,678	59,432	43,778	28,088	8,808	2,131	2,642
Northern white-cedar	286,155	2,076	8,701	23,026	62,656	78,306	42,231	34,242	34,917
Tamarack	240,604	11,717	27,877	44,800	60,420	51,004	17,985	18,843	7,958
Oak-hickory	365,073	9,504	18,008	154,176	103,928	63,270	9,600	6,587	--
Elm-ash-soft maple	484,388	31,559	25,090	102,649	169,109	86,243	37,434	18,720	13,584
Maple-basswood	789,754	18,278	44,119	253,357	277,937	140,245	43,168	8,392	4,258
Aspen	2,707,238	196,358	412,280	1,225,012	740,151	113,055	18,228	2,154	--
Paper birch	431,116	13,776	33,433	193,047	150,116	27,110	671	11,145	1,818
Balsam poplar	185,057	19,726	32,486	82,702	39,594	9,499	1,050	--	--
Nonstocked	2,822	1,506	218	699	399	--	--	--	--
All types	6,585,772	345,107	778,678	2,493,757	1,907,920	673,336	212,419	109,378	65,177
Central hardwood									
Jack pine	17,015	1,401	5,573	10,041	--	--	--	--	--
Red pine	28,454	--	19,530	7,694	--	1,230	--	--	--
White pine	10,736	--	--	4,298	--	6,438	--	--	--
Balsam fir	7,068	881	--	5,250	937	--	--	--	--
White spruce	68	--	68	--	--	--	--	--	--
Black spruce	15,353	2,111	2,610	36	10,596	--	--	--	--
Tamarack	28,014	1,427	4,568	8,859	9,298	2,251	--	1,611	--
Oak-hickory	908,450	10,200	29,075	213,560	305,052	219,493	123,683	4,917	2,470
Elm-ash-soft maple	254,480	17,608	27,948	67,295	89,252	31,768	9,305	10,706	598
Maple-basswood	480,964	39,841	28,331	135,194	142,120	97,747	33,344	2,216	2,171
Aspen	512,507	33,964	103,398	272,520	86,852	15,773	--	--	--
Paper birch	55,875	1,289	7,957	28,086	15,057	2,923	563	--	--
Balsam poplar	11,427	74	1,799	9,554	--	--	--	--	--
Nonstocked	519	80	--	113	326	--	--	--	--
All types	2,330,930	108,876	230,857	762,500	659,490	377,623	166,895	19,450	5,239
Prairie									
Red pine	1,212	--	--	1,212	--	--	--	--	--
White pine	1,294	--	--	--	1,294	--	--	--	--
Black spruce	1,700	--	528	--	1,172	--	--	--	--
Tamarack	1,398	--	1,398	--	--	--	--	--	--
Oak-hickory	133,130	1,540	1,722	13,338	48,934	41,059	20,800	5,737	--
Elm-ash-soft maple	93,840	3,056	16,127	38,529	28,428	4,589	3,111	--	--
Maple-basswood	179,404	8,673	4,316	28,140	82,818	32,744	22,118	595	--
Aspen	138,889	23,603	36,603	58,771	19,912	--	--	--	--
Balsam poplar	14,330	687	4,134	9,509	--	--	--	--	--
Nonstocked	177	177	--	--	--	--	--	--	--
All types	565,374	37,736	64,828	149,499	182,558	78,392	46,029	6,332	--

Table 52.--Net volume of sawtimber on timberland by forest type, stand-age class, and Forest Survey Unit, Minnesota, 1990

(In thousand board feet) [1]

Unit and forest type	All classes	Stand-age class (years) 1-20	21- 40	41-60	61-80	81-100	101-120	121-140	141+
All Units									
Jack pine	1,482,185	19,668	145,063	660,259	513,481	110,168	29,157	4,389	--
Red pine	1,753,419	28,551	186,324	473,230	498,186	358,964	175,964	29,465	2,735
White pine	509,847	12,928	7,017	33,632	184,668	101,214	148,711	21,677	--
Balsam fir	1,590,511	103,621	144,076	646,544	469,581	191,059	34,409	1,221	--
White spruce	264,115	10,834	36,082	89,765	65,448	57,261	--	4,725	--
Black spruce	819,447	24,692	83,688	242,159	274,040	140,324	40,394	9,883	4,267
Northern white-cedar	1,969,414	12,268	48,230	82,243	281,654	442,915	322,816	340,907	438,381
Tamarack	633,220	29,464	54,562	111,662	183,988	132,345	39,053	59,928	22,218
Oak-hickory	4,146,413	48,092	77,605	836,046	1,361,277	1,127,480	611,784	74,643	9,486
Elm-ash-soft maple	2,753,736	183,529	158,332	522,244	911,529	528,783	213,229	142,717	93,373
Maple-basswood	4,714,325	191,714	178,023	1,013,748	1,651,836	1,141,871	426,761	79,283	31,089
Aspen	11,476,707	687,940	1,195,783	4,607,318	4,064,524	770,551	121,872	20,951	7,768
Paper birch	1,867,569	63,501	119,835	660,492	705,351	219,716	29,042	66,607	3,025
Balsam poplar	820,207	45,346	52,048	362,490	254,737	87,544	9,770	5,562	2,710
Nonstocked	9,352	6,601	--	672	2,079	--	--	--	--
All types	34,810,467	1,468,749	2,486,668	10,342,504	11,422,379	5,410,195	2,202,962	861,958	615,052
Aspen-birch									
Jack pine	472,125	6,776	30,464	144,491	194,768	62,080	29,157	4,389	--
Red pine	679,684	13,661	65,605	153,678	213,416	175,610	35,703	19,276	2,735
White pine	277,812	11,863	641	1,595	81,190	56,260	126,263	--	--
Balsam fir	1,126,249	85,032	112,419	435,498	317,247	140,423	34,409	1,221	--
White spruce	184,303	8,915	23,730	76,421	39,000	31,512	--	4,725	--
Black spruce	609,166	16,368	57,066	168,078	204,923	115,705	37,175	5,584	4,267
Northern white-cedar	1,335,747	8,373	28,146	42,925	170,128	275,977	225,510	260,278	324,410
Tamarack	231,159	13,614	19,940	38,370	56,422	51,819	6,917	30,590	13,487
Oak-hickory	25,722	4,546	--	2,946	10,142	8,088	--	--	--
Elm-ash-soft maple	683,211	60,718	30,354	96,492	155,246	183,660	73,078	35,528	48,135
Maple-basswood	695,250	31,683	42,016	147,263	148,271	208,906	68,263	38,981	9,867
Aspen	4,210,229	255,753	468,666	1,446,405	1,611,778	348,519	58,836	12,504	7,768
Paper birch	941,938	35,370	63,253	306,314	348,019	135,088	26,214	27,680	--
Balsam poplar	411,169	17,392	19,354	170,285	132,096	57,517	6,253	5,562	2,710
Nonstocked	6,134	3,973	--	672	1,489	--	--	--	--
All types	11,889,898	574,037	961,654	3,231,433	3,684,135	1,851,164	727,778	446,318	413,379

(Table 52 continued on next page)

[1] International 1/4-inch rule

(Table 52 continued)

Unit and forest type	All classes	Stand-age class (years) 1-20	21-40	41-60	61-80	81-100	101-120	121-140	141+
Northern pine									
Jack pine	967,160	9,809	107,860	482,690	318,713	48,088	--	--	--
Red pine	1,024,909	14,890	100,594	295,226	284,770	178,979	140,261	10,189	--
White pine	180,422	1,065	6,376	19,965	97,364	11,527	22,448	21,677	--
Balsam fir	444,016	16,445	31,657	195,703	149,575	50,636	--	--	--
White spruce	79,741	1,919	12,281	13,344	26,448	25,749	--	--	--
Black spruce	192,514	6,059	25,678	74,081	54,559	24,619	3,219	4,299	--
Northern white-cedar	633,667	3,895	20,084	39,318	111,526	166,938	97,306	80,629	113,971
Tamarack	347,242	15,266	30,571	56,680	103,790	72,947	32,136	27,121	8,731
Oak-hickory	848,993	17,978	29,572	290,526	242,762	209,429	32,685	26,041	--
Elm-ash-soft maple	1,072,465	69,115	37,826	170,163	371,879	215,559	106,573	57,628	43,722
Maple-basswood	1,943,865	38,373	80,609	451,669	748,885	443,582	139,588	28,388	12,771
Aspen	6,138,395	363,924	576,003	2,588,377	2,173,935	364,673	63,036	8,447	--
Paper birch	832,526	26,338	48,666	309,039	330,306	75,007	1,218	38,927	3,025
Balsam poplar	375,648	27,192	29,577	162,694	122,641	30,027	3,517	--	--
Nonstocked	3,218	2,628	--	--	590	--	--	--	--
All types	15,084,781	614,896	1,137,354	5,149,475	5,137,743	1,917,760	641,987	303,346	182,220
Central hardwood									
Jack pine	42,900	3,083	6,739	33,078	--	--	--	--	--
Red pine	43,446	--	20,125	18,946	--	4,375	--	--	--
White pine	45,499	--	--	12,072	--	33,427	--	--	--
Balsam fir	20,246	2,144	--	15,343	2,759	--	--	--	--
White spruce	71	--	71	--	--	--	--	--	--
Black spruce	16,547	2,265	944	--	13,338	--	--	--	--
Tamarack	54,819	584	4,051	16,612	23,776	7,579	--	2,217	--
Oak-hickory	2,805,577	23,147	43,500	505,212	956,350	757,742	489,184	20,956	9,486
Elm-ash-soft maple	704,762	42,216	52,056	145,799	281,803	107,361	24,450	49,561	1,516
Maple-basswood	1,411,940	99,004	45,093	333,735	428,919	365,013	122,289	9,436	8,451
Aspen	954,676	51,104	121,266	481,625	243,322	57,359	--	--	--
Paper birch	93,105	1,793	7,916	45,139	27,026	9,621	1,610	--	--
Balsam poplar	23,473	--	--	23,473	--	--	--	--	--
All types	6,217,061	225,340	301,761	1,631,034	1,977,293	1,342,477	637,533	82,170	19,453
Prairie									
Red pine	5,380	--	--	--	--	--	--	--	--
White pine	6,114	--	--	--	6,114	--	--	--	--
Black spruce	1,220	--	--	--	1,220	--	--	--	--
Oak-hickory	466,121	2,421	4,533	37,362	152,023	152,221	89,915	27,646	--
Elm-ash-soft maple	293,298	11,480	38,096	109,790	102,601	22,203	9,128	--	--
Maple-basswood	663,270	22,654	10,305	81,081	325,761	124,370	96,621	2,478	--
Aspen	173,407	17,159	29,848	90,911	35,489	--	--	--	--
Balsam poplar	9,917	762	3,117	6,038	--	--	--	--	--
All types	1,618,727	54,476	85,899	330,562	623,208	298,794	195,664	30,124	--

Table 53.--Net volume of growing stock on timberland by forest type, basal-area class, and stand-size class, Minnesota, 1990

(In thousand cubic feet)

Forest type and stand-size class	All classes	Basal-area class (square feet per acre)													
		0-10	11-20	21-30	31- 40	41-50	51-60	61-70	71-80	81-90	91-100	101-120	121-150	151-180	181+
Jack pine															
Sawtimber	320,295	--	--	4,337	1,771	4,190	18,640	13,552	22,319	34,338	44,776	73,128	78,746	24,497	--
Poletimber	202,461	--	--	703	--	2,021	3,779	4,765	21,975	14,872	36,566	43,976	52,362	19,073	2,370
Sapling and seedling	14,773	622	1,146	2,345	1,218	1,348	1,970	3,129	2,366	629	--	--	--	--	--
Total	537,530	622	1,146	7,385	2,989	7,559	24,389	21,445	46,659	49,840	81,342	117,105	131,107	43,570	2,370
Red pine															
Sawtimber	384,116	--	263	--	2,532	--	8,946	15,439	15,468	20,655	16,821	59,287	126,839	85,475	32,390
Poletimber	111,203	--	--	189	--	2,437	5,273	1,924	3,469	5,357	4,252	25,606	26,832	15,090	20,775
Sapling and seedling	9,988	167	842	129	2,852	1,107	2,983	--	464	--	809	636	--	--	--
Total	505,307	167	1,105	317	5,384	3,544	17,202	17,363	19,400	26,012	21,882	85,530	153,671	100,565	53,164
White pine															
Sawtimber	114,215	--	--	--	--	855	2,952	1,291	3,554	3,072	14,632	24,991	39,418	15,262	8,189
Poletimber	11,391	--	--	--	--	--	--	1,031	2,635	--	--	5,414	--	2,311	--
Sapling and seedling	2,360	--	--	--	--	--	2,360	--	--	--	--	--	--	--	--
Total	127,966	--	--	--	--	855	5,312	2,322	6,189	3,072	14,632	30,405	39,418	17,573	8,189
Balsam fir															
Sawtimber	269,013	--	129	296	2,471	5,503	10,504	14,035	17,330	33,867	18,053	68,497	75,507	22,822	--
Poletimber	364,152	--	272	4,314	2,894	11,803	22,657	13,169	25,671	34,473	29,880	80,263	96,600	31,607	10,549
Sapling and seedling	84,493	502	2,592	8,673	8,528	12,766	15,382	8,183	8,011	5,235	2,119	7,532	4,969	--	--
Total	717,657	502	2,993	13,283	13,893	30,072	48,542	35,387	51,012	73,575	50,053	156,293	177,076	54,428	10,549
White spruce															
Sawtimber	48,738	--	284	377	605	1,359	5,870	--	5,236	3,717	2,043	11,349	7,776	10,121	--
Poletimber	39,736	--	165	496	--	1,362	4,704	--	3,853	--	1,456	11,540	9,593	6,568	--
Sapling and seedling	6,835	58	868	164	554	1,561	335	--	3,296	--	--	--	--	--	--
Total	95,310	58	1,317	1,036	1,159	4,283	10,909	--	12,386	3,717	3,499	22,889	17,369	16,688	--
Black spruce															
Sawtimber	77,137	--	1,093	--	2,033	4,990	7,436	5,023	10,276	8,689	7,988	18,235	7,254	4,119	--
Poletimber	473,550	--	523	438	5,983	17,038	30,344	35,286	42,109	69,847	45,120	105,064	84,191	28,376	9,231
Sapling and seedling	208,149	904	5,518	11,307	13,468	25,396	21,847	18,291	22,927	24,809	19,790	29,098	13,418	1,376	--
Total	758,836	904	7,133	11,744	21,484	47,423	59,627	58,600	75,313	103,346	72,899	152,398	104,863	33,872	9,231
Northern white-cedar															
Sawtimber	429,630	--	139	--	1,202	7,077	7,971	6,100	17,433	21,529	17,627	53,783	123,550	111,516	61,704
Poletimber	320,242	--	438	734	1,337	1,004	3,623	3,384	10,774	11,902	21,485	45,732	90,138	58,029	71,663
Sapling and seedling	42,132	131	908	984	1,727	3,535	4,321	3,170	7,578	2,699	1,148	12,469	3,462	--	--
Total	792,004	131	1,484	1,719	4,266	11,616	15,915	12,654	35,785	36,130	40,260	111,984	217,150	169,545	133,367

(Table 53 continued on next page)

(Table 53 continued)

Forest type and stand-size class	All classes	Basal-area class (square feet per acre)													
		0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-120	121-150	151-180	181+
Tamarack															
Sawtimber	97,443	--	1,686	4,936	6,603	11,144	15,342	13,540	6,558	6,480	11,844	9,840	2,111	7,359	--
Poletimber	228,384	--	1,846	3,320	5,222	19,334	21,413	26,270	36,193	35,706	28,016	36,836	11,319	2,908	--
Sapling and seedling	81,118	2,097	3,711	6,447	9,270	14,303	12,945	7,427	10,021	5,722	3,881	2,981	2,313	--	--
Total	406,944	2,097	7,243	14,704	21,095	44,780	49,700	47,236	52,771	47,908	43,741	49,658	15,744	10,267	--
Oak-hickory															
Sawtimber	1,048,338	105	186	834	2,680	16,835	30,781	38,292	75,988	105,647	122,442	279,112	309,750	61,797	3,891
Poletimber	340,344	--	135	1,460	1,333	7,454	25,092	15,809	17,914	42,869	34,149	92,651	91,386	10,093	--
Sapling and seedling	25,501	344	1,007	2,862	3,255	5,813	5,677	2,970	2,034	1,539	--	--	--	--	--
Total	1,414,183	449	1,328	5,156	7,267	30,102	61,550	57,071	95,936	150,055	156,591	371,764	401,135	71,890	3,891
Elm-ash-soft maple															
Sawtimber	515,329	--	793	3,505	8,364	14,802	23,393	28,294	48,148	59,935	32,654	106,841	126,770	48,897	12,932
Poletimber	547,436	75	812	3,986	6,700	25,145	20,228	28,234	72,008	62,936	47,629	151,587	93,057	25,067	9,972
Sapling and seedling	118,816	611	7,791	19,703	12,499	27,121	24,573	9,937	7,322	3,238	2,598	3,423	--	--	--
Total	1,181,581	686	9,396	27,193	27,563	67,069	68,194	66,466	127,479	126,108	82,881	261,851	219,827	73,963	22,904
Maple-basswood															
Sawtimber	1,132,555	8,737	240	2,495	2,112	8,254	33,960	26,582	57,906	90,223	105,195	273,240	378,475	133,923	11,211
Poletimber	509,214	--	510	1,093	208	4,829	15,829	12,895	41,092	45,145	50,648	125,983	159,592	46,845	4,544
Sapling and seedling	101,292	535	2,050	8,370	7,211	15,147	20,784	15,820	15,279	9,608	2,969	699	2,821	--	--
Total	1,743,060	9,272	2,800	11,959	9,532	28,230	70,573	55,297	114,277	144,976	158,812	399,921	540,888	180,768	15,755
Aspen															
Sawtimber	2,445,867	--	2,308	7,736	17,016	58,711	80,840	110,625	160,362	248,416	184,675	637,262	599,967	274,195	63,755
Poletimber	2,429,401	--	5,172	7,694	17,377	50,041	125,296	107,842	235,049	285,430	233,774	610,569	493,320	234,810	23,028
Sapling and seedling	493,699	6,653	22,176	53,707	50,283	85,659	81,879	63,834	56,772	33,133	18,885	17,066	2,495	1,159	--
Total	5,368,715	6,653	29,656	69,137	84,675	194,410	288,015	282,300	452,183	566,979	437,333	1,264,897	1,095,530	510,164	86,783
Paper birch															
Sawtimber	287,564	2,325	1,023	562	2,028	7,755	14,221	21,448	32,037	31,519	27,173	64,361	65,993	17,119	--
Poletimber	709,179	--	172	1,878	5,327	9,372	29,837	29,217	60,818	61,196	51,634	163,061	217,860	57,749	21,057
Sapling and seedling	52,453	312	2,220	7,086	3,691	6,982	10,756	4,615	7,800	2,852	2,284	1,605	2,251	--	--
Total	1,049,197	2,637	3,415	9,525	11,046	24,108	54,814	55,280	100,656	95,567	81,092	229,027	286,104	74,869	21,057
Balsam poplar															
Sawtimber	181,625	--	684	1,907	681	7,585	4,852	15,417	11,574	15,563	13,710	41,423	31,581	7,114	29,532
Poletimber	160,258	--	287	3,774	6,524	14,829	9,817	10,870	13,450	26,248	10,005	36,761	16,091	11,602	--
Sapling and seedling	47,054	1,335	2,092	6,514	4,390	7,562	9,411	5,831	1,530	1,992	4,330	2,069	--	--	--
Total	388,937	1,335	3,063	12,195	11,595	29,977	24,081	32,117	26,554	43,803	28,045	80,253	47,672	18,716	29,532
Nonstocked	6,496	2,531	2,805	1,160	--	--	--	--	--	--	--	--	--	--	--
All types															
Sawtimber	7,351,864	11,167	8,828	26,985	50,098	149,060	265,708	309,637	484,189	683,651	619,633	1,721,352	1,973,737	824,216	223,603
Poletimber	6,446,951	75	10,330	30,079	52,905	166,669	317,892	290,695	587,011	695,982	594,614	1,535,043	1,442,341	550,127	173,189
Sapling and seedling	1,288,664	14,269	52,920	128,290	118,945	208,299	215,223	143,206	145,400	91,456	58,814	77,579	31,729	2,535	--
Nonstocked	6,496	2,531	2,805	1,160	--	--	--	--	--	--	--	--	--	--	--
All stands	15,093,975	28,042	74,883	186,513	221,948	524,028	798,824	743,538	1,216,600	1,471,088	1,273,060	3,333,974	3,447,807	1,376,879	396,792

Table 54.--Net volume of sawtimber on timberland by forest type, basal-area class, and stand-size class, Minnesota, 1990

(In thousand board feet)[1]

Forest type and stand-size class	All classes	Basal-area class (square feet per acre)													
		0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-120	121-150	151-180	181+
Jack pine															
Sawtimber	1,144,604	--	--	20,101	7,753	15,875	70,937	49,523	77,670	119,593	165,195	266,790	273,334	77,833	--
Poletimber	315,928	--	--	308	--	4,138	6,084	9,056	30,073	24,707	60,905	72,009	80,706	22,540	5,402
Sapling and seedling	25,876	1,511	2,222	6,080	1,374	3,310	2,265	5,059	3,486	568	--	--	--	--	--
Total	1,486,408	1,511	2,222	26,489	9,127	23,323	79,286	63,638	111,229	144,868	226,100	338,799	354,040	100,373	5,402
Red pine															
Sawtimber	1,606,580	--	1,437	--	12,502	--	40,055	68,076	67,256	94,436	68,370	246,941	533,242	344,224	130,039
Poletimber	125,727	--	--	324	--	1,605	6,621	4,135	3,843	7,542	7,850	30,247	31,297	15,125	17,139
Sapling and seedling	26,214	326	2,708	--	10,563	797	7,461	--	368	--	3,266	725	--	--	--
Total	1,758,520	326	4,145	324	23,064	2,401	54,138	72,211	71,468	101,979	79,487	277,912	564,539	359,350	147,178
White pine															
Sawtimber	473,279	--	--	--	--	3,229	13,634	6,097	13,253	12,622	64,998	110,756	165,149	56,151	27,388
Poletimber	26,319	--	--	--	--	--	--	2,230	4,677	--	--	14,325	--	5,087	--
Sapling and seedling	11,830	--	--	--	--	--	11,830	--	--	--	--	--	--	--	--
Total	511,429	--	--	--	--	3,229	25,465	8,327	17,931	12,622	64,998	125,082	165,149	61,238	27,388
Balsam fir															
Sawtimber	872,302	--	673	1,201	8,443	22,363	38,660	47,369	57,570	107,770	64,160	224,804	234,278	65,012	--
Poletimber	557,581	--	297	7,931	4,094	19,703	33,159	21,307	39,058	62,845	44,547	112,785	138,974	55,843	17,039
Sapling and seedling	159,551	1,708	8,343	15,114	21,321	21,185	25,853	15,792	16,246	9,920	2,543	14,972	6,554	--	--
Total	1,589,434	1,708	9,313	24,246	33,858	63,250	97,672	84,469	112,875	180,534	111,250	352,560	379,805	120,855	17,039
White spruce															
Sawtimber	177,140	--	873	1,994	2,484	6,202	26,757	--	17,798	10,910	6,967	44,233	26,592	32,331	--
Poletimber	72,880	--	--	--	--	2,375	10,096	--	1,382	--	1,058	24,248	18,487	15,233	--
Sapling and seedling	14,428	--	3,468	337	1,189	4,349	633	--	4,452	--	--	--	--	--	--
Total	264,448	--	4,341	2,332	3,673	12,926	37,487	--	23,632	10,910	8,025	68,481	45,079	47,564	--
Black spruce															
Sawtimber	251,750	--	4,347	--	6,258	15,760	28,545	16,659	32,485	26,606	24,765	57,567	27,323	11,436	--
Poletimber	440,681	--	813	--	5,781	23,131	32,301	46,308	39,074	71,494	46,050	95,083	65,811	9,189	5,646
Sapling and seedling	125,180	1,116	5,769	9,400	15,627	17,435	15,594	11,976	12,637	7,600	17,150	8,847	2,029	--	--
Total	817,611	1,116	10,929	9,400	27,666	56,326	76,440	74,943	84,197	105,699	87,964	161,496	95,163	20,625	5,646
Northern white-cedar															
Sawtimber	1,457,678	--	713	--	4,752	25,393	25,577	18,355	61,478	70,926	55,794	185,468	429,925	367,265	212,031
Poletimber	452,401	--	917	1,593	888	2,294	4,528	4,116	12,824	18,043	33,108	69,707	128,778	80,730	94,877
Sapling and seedling	55,306	715	2,160	1,243	4,373	6,783	3,950	2,845	8,277	3,565	2,872	12,867	5,656	--	--
Total	1,965,386	715	3,791	2,835	10,012	34,470	34,055	25,316	82,579	92,535	91,774	268,042	564,359	447,995	306,908

(Table 54 continued on next page)

[1] International 1/4-inch rule

(Table 54 continued)

Forest type and stand-size class	All classes	Basal-area class (square feet per acre)													
		0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-120	121-150	151-180	181+
Tamarack															
Sawtimber	339,350	--	6,318	21,506	24,803	43,696	55,841	48,088	22,282	23,239	36,083	31,492	6,376	19,626	--
Poletimber	224,218	--	1,606	2,998	4,480	30,849	19,192	26,827	35,930	30,878	31,619	26,422	9,769	3,650	--
Sapling and seedling	69,297	1,585	5,311	7,349	15,755	14,293	7,408	7,188	7,042	1,349	949	--	1,069	--	--
Total	632,865	1,585	13,234	31,852	45,037	88,838	82,441	82,103	65,253	55,466	68,652	57,914	17,215	23,276	--
Oak-hickory															
Sawtimber	3,608,532	284	940	2,731	6,796	59,960	107,176	139,457	253,726	359,711	436,654	950,550	1,079,569	195,880	15,098
Poletimber	478,078	--	359	1,232	1,637	11,193	28,497	17,436	27,726	72,057	52,113	132,159	121,525	12,143	--
Sapling and seedling	56,102	394	3,034	6,163	5,738	14,008	12,487	8,423	3,257	2,599	--	--	--	--	--
Total	4,142,713	678	4,333	10,126	14,172	85,161	148,160	165,316	284,709	434,367	488,768	1,082,709	1,201,093	208,023	15,098
Elm-ash-soft maple															
Sawtimber	1,704,575	--	4,009	13,006	29,771	48,838	84,485	96,524	162,337	180,450	110,063	354,014	418,101	157,967	45,010
Poletimber	810,242	--	791	3,944	5,937	35,246	23,386	41,202	95,541	84,665	79,903	263,166	127,947	36,043	12,471
Sapling and seedling	236,788	675	17,869	47,674	22,274	55,914	42,797	22,161	13,409	5,947	3,968	4,101	--	--	--
Total	2,751,605	675	22,668	64,625	57,981	139,998	150,668	159,887	271,288	271,062	193,934	621,281	546,048	194,010	57,480
Maple-basswood															
Sawtimber	3,723,146	32,025	574	8,591	8,450	31,774	114,359	93,282	212,495	313,352	376,085	895,841	1,206,002	397,403	32,912
Poletimber	756,583	--	1,178	2,188	--	7,058	22,147	17,204	61,892	59,997	72,042	203,393	239,316	66,667	3,501
Sapling and seedling	231,366	1,492	4,214	26,865	16,318	38,610	51,059	21,683	39,294	19,004	6,511	1,002	5,313	--	--
Total	4,711,095	33,517	5,967	37,644	24,768	77,442	187,566	132,168	313,681	392,354	454,639	1,100,237	1,450,631	464,070	36,414
Aspen															
Sawtimber	7,527,304	--	8,132	25,403	60,871	194,523	258,905	354,490	515,012	756,444	578,299	1,975,831	1,871,903	834,828	183,407
Poletimber	3,160,635	--	4,467	6,745	16,894	53,796	158,409	149,183	287,698	380,472	339,148	827,482	619,632	285,545	31,163
Sapling and seedling	792,447	12,667	36,111	105,069	76,299	146,034	133,630	98,060	73,435	52,936	30,595	27,173	--	436	--
Total	11,480,386	12,667	48,710	137,217	154,065	394,353	550,944	601,734	876,146	1,189,852	948,041	2,830,486	2,400,791	1,120,809	214,570
Paper birch															
Sawtimber	873,459	5,521	4,769	1,606	5,198	28,351	43,151	64,389	104,051	92,499	79,498	195,231	196,232	52,965	--
Poletimber	900,779	--	355	1,724	9,302	12,295	38,070	37,393	76,907	75,929	75,653	226,419	267,085	52,067	27,579
Sapling and seedling	95,293	351	7,404	9,141	10,308	14,239	21,654	7,794	17,030	900	2,694	1,924	1,856	--	--
Total	1,869,531	5,872	12,527	12,471	24,808	54,885	102,875	109,577	197,988	169,327	157,845	423,574	465,173	105,032	27,579
Balsam poplar															
Sawtimber	576,810	--	2,043	6,129	1,880	27,839	18,166	48,600	35,623	51,778	44,848	140,150	100,494	16,882	82,377
Poletimber	186,152	--	--	5,039	8,382	17,975	10,360	12,411	13,428	33,914	6,811	43,442	21,532	12,858	--
Sapling and seedling	56,734	311	3,500	9,855	3,664	11,165	8,731	6,968	--	3,843	7,464	1,233	--	--	--
Total	819,697	311	5,544	21,023	13,926	56,980	37,257	67,978	49,051	89,536	59,124	184,825	122,025	29,740	82,377
Nonstocked	9,338	4,867	4,472	--	--	--	--	--	--	--	--	--	--	--	--
All types															
Sawtimber	24,336,511	37,830	34,829	102,268	179,959	523,804	926,251	1,050,911	1,633,037	2,220,336	2,111,780	5,679,669	6,477,775	2,629,803	728,263
Poletimber	8,508,206	--	10,782	34,026	57,395	221,656	392,850	388,807	730,054	922,544	850,808	2,140,888	1,870,858	672,720	214,817
Sapling and seedling	1,956,411	22,851	102,113	244,290	204,802	348,122	345,352	207,950	198,933	108,230	78,012	72,842	22,478	436	--
Nonstocked	9,338	4,867	4,472	--	--	--	--	--	--	--	--	--	--	--	--
All stands	34,810,467	65,547	152,196	380,584	442,155	1,093,582	1,664,453	1,647,668	2,562,024	3,251,111	3,040,599	7,893,399	8,371,110	3,302,958	943,080

Table 55.--Net volume of sawtimber on timberland by species group, log grade, and diameter class, Minnesota, 1990

(In thousand board feet) [1]

Species group	All grades					Log grade 1				
		Diameter class (inches at breast height)					Diameter class (inches at breast height)			
	Total	9.0-14.9	15.0-18.9	19.0-20.9	21.0+	Total	9.0-14.9	15.0-18.9	19.0-20.9	21.0+
Softwoods										
Jack pine	1,698,838	1,502,395	171,228	14,213	11,002	10,006	8,037	--	1,969	--
Red pine	2,429,466	1,193,263	721,045	252,911	262,247	240,332	39,495	72,956	54,163	73,718
White pine	1,287,412	329,300	264,572	153,977	539,563	224,000	17,970	32,748	25,839	147,443
White spruce	1,147,695	689,985	298,347	87,023	72,340	21,306	--	10,385	8,169	2,752
Black spruce	709,109	675,551	26,470	--	7,088	--	--	--	--	--
Balsam fir	1,854,099	1,756,512	97,587	--	--	--	--	--	--	--
Tamarack	833,890	759,107	58,438	11,218	5,127	--	--	--	--	--
Eastern redcedar	29,531	25,611	3,920	--	--	--	--	--	--	--
Northern white-cedar	2,191,719	1,735,963	334,837	65,621	55,298	15,375	--	3,754	3,633	7,988
Other softwoods	8,140	8,140	--	--	--	--	--	--	--	--
Total	12,189,899	8,675,827	1,976,444	584,963	952,665	511,019	65,502	119,843	93,773	231,901
Hardwoods										
Select white oak	1,819,363	758,100	590,809	165,014	305,440	83,239	1,977	17,892	6,741	56,629
Select red oak	2,632,750	1,085,339	854,704	257,300	435,407	162,284	3,472	65,062	35,779	57,971
Other red oak	123,672	38,826	36,020	15,617	33,209	7,443	--	--	3,362	4,081
Hickory	50,375	37,230	12,681	464	--	1,757	--	1,757	--	--
Basswood	1,820,693	893,928	563,103	143,112	220,550	431,604	35,801	212,120	71,839	111,844
Yellow birch	72,693	29,035	22,098	10,314	11,246	15,147	--	4,576	2,499	8,072
Hard maple	803,435	391,763	270,583	63,609	77,480	90,782	2,757	67,768	12,549	7,708
Soft maple	502,432	276,187	108,856	43,195	74,194	40,032	1,323	7,672	9,881	21,156
Elm	635,878	289,558	178,857	62,249	105,214	51,358	6,176	20,233	7,838	17,111
Black ash	966,959	709,777	205,438	29,053	22,691	79,204	15,186	46,919	17,099	--
White and green ash	484,770	243,014	139,051	43,207	59,498	86,771	4,291	39,796	11,374	31,310
Cottonwood	235,374	20,176	32,240	22,278	160,680	70,982	--	2,140	10,597	58,245
Willow	95,126	36,420	33,315	7,881	17,510	--	--	--	--	--
Hackberry	23,940	23,940	--	--	--	--	--	--	--	--
Balsam poplar	1,155,227	782,164	296,605	40,265	36,193	59,769	4,222	37,051	4,996	13,500
Bigtooth aspen	748,265	521,399	194,223	21,487	11,156	22,678	5,632	10,398	1,343	5,305
Quaking aspen	8,631,429	6,025,655	2,152,098	263,737	189,939	324,571	26,016	224,652	41,124	32,779
Paper birch	1,622,177	1,288,063	280,191	25,181	28,742	69,879	13,497	44,373	4,320	7,689
Black cherry	26,808	18,708	8,100	--	--	--	--	--	--	--
Black walnut	46,779	19,377	20,925	2,551	3,926	--	--	--	--	--
Butternut	33,328	19,926	11,119	--	2,283	13,402	--	11,119	--	2,283
Other hardwoods	89,095	59,922	29,173	--	--	--	--	--	--	--
Total	22,620,568	13,568,507	6,040,189	1,216,514	1,795,358	1,610,902	120,350	813,528	241,341	435,683
All species	34,810,467	22,244,334	8,016,633	1,801,477	2,748,023	2,121,921	185,852	933,371	335,114	667,584

(Table 55 continued on next page)

[1] International 1/4-inch rule.

(Table 55 continued)

Species group	Log grade 2					Log grade 3				
		Diameter class (inches at breast height)					Diameter class (inches at breast height)			
	Total	9.0-14.9	15.0-18.9	19.0-20.9	21.0+	Total	9.0-14.9	15.0-18.9	19.0-20.9	21.0+
Softwoods										
Jack pine	109,181	83,141	26,040	--	--	1,579,651	1,411,217	145,188	12,244	11,002
Red pine	439,226	112,950	195,201	65,579	65,496	1,748,983	1,039,893	452,888	133,169	123,033
White pine	393,413	95,847	81,941	61,664	153,961	552,933	200,213	137,636	54,694	160,390
White spruce	83,971	26,450	38,668	4,427	14,426	1,040,633	661,750	249,294	74,427	55,162
Black spruce	13,592	5,606	7,986	--	--	695,517	669,945	18,484	--	7,088
Balsam fir	22,066	13,132	8,934	--	--	1,832,033	1,743,380	88,653	--	--
Tamarack	45,664	37,132	2,498	6,034	--	785,683	719,432	55,940	5,184	5,127
Eastern redcedar	2,101	1,306	795	--	--	27,430	24,305	3,125	--	--
Northern white-cedar	164,099	71,240	64,739	13,642	14,478	2,006,237	1,660,290	264,769	48,346	32,832
Other softwoods	--	--	--	--	--	8,140	8,140	--	--	--
Total	1,273,313	446,804	426,802	151,346	248,361	10,277,240	8,138,565	1,415,977	328,064	394,634
Hardwoods										
Select white oak	281,256	64,406	132,063	28,265	56,522	802,781	372,685	233,468	70,614	126,014
Select red oak	655,755	153,950	259,493	95,081	147,231	1,260,949	665,619	335,224	88,319	171,787
Other red oak	17,320	1,173	5,238	7,559	3,350	34,044	12,751	7,603	--	13,690
Hickory	7,987	3,398	4,589	--	--	26,416	23,335	3,081	--	--
Basswood	563,864	308,122	171,952	26,898	56,892	782,411	522,500	167,618	44,375	47,918
Yellow birch	12,498	3,255	6,240	1,902	1,101	36,638	21,553	9,375	3,637	2,073
Hard maple	227,713	80,162	100,523	31,234	15,794	394,039	253,284	90,987	17,173	32,595
Soft maple	65,259	28,426	21,350	8,645	6,838	289,315	205,678	40,589	21,501	21,547
Elm	170,347	48,483	76,870	7,957	37,037	304,176	179,259	49,167	32,200	43,550
Black ash	246,987	147,153	73,163	9,742	16,929	583,380	506,571	68,835	2,212	5,762
White and green ash	105,078	47,799	31,197	10,549	15,533	215,102	133,382	55,254	16,083	10,383
Cottonwood	66,857	4,893	9,702	8,983	43,279	75,177	10,533	15,396	2,698	46,550
Willow	6,283	3,774	--	2,509	--	14,863	8,205	6,658	--	--
Hackberry	2,639	2,639	--	--	--	18,776	18,776	--	--	--
Balsam poplar	169,249	56,419	98,992	4,539	9,299	830,971	643,143	148,060	26,374	13,394
Bigtooth aspen	164,892	71,202	76,596	13,161	3,933	482,824	386,191	87,732	6,983	1,918
Quaking aspen	1,342,665	718,373	519,202	53,354	51,736	6,214,686	4,679,112	1,274,253	161,889	99,432
Paper birch	298,959	196,535	87,329	6,218	8,877	1,119,355	972,020	125,881	10,865	10,589
Black cherry	3,138	3,138	--	--	--	18,573	10,473	8,100	--	--
Black walnut	24,265	11,520	7,859	960	3,926	18,445	5,379	13,066	--	--
Butternut	--	--	--	--	--	10,158	10,158	--	--	--
Other hardwoods	4,287	--	4,287	--	--	44,138	40,115	4,023	--	--
Total	4,437,298	1,954,820	1,686,645	317,556	478,277	13,577,217	9,680,722	2,744,370	504,923	647,202
All species	5,710,611	2,401,624	2,113,447	468,902	726,638	23,854,457	17,819,287	4,160,347	832,987	1,041,836

(Table 55 continued on next page)

(Table 55 continued)

Species group	Log grade 4				
		Diameter class (inches at breast height)			
	Total	9.0-14.9	15.0-18.9	19.0-20.9	21.0+
Softwoods					
Jack pine	--	--	--	--	--
Red pine	925	925	--	--	--
White pine	117,066	15,270	12,247	11,780	77,769
White spruce	1,785	1,785	--	--	--
Black spruce	--	--	--	--	--
Balsam fir	--	--	--	--	--
Tamarack	2,543	2,543	--	--	--
Eastern redcedar	--	--	--	--	--
Northern white-cedar	6,008	4,433	1,575	--	--
Other softwoods	--	--	--	--	--
Total	128,327	24,956	13,822	11,780	77,769
Hardwoods					
Select white oak	652,087	319,032	207,386	59,394	66,275
Select red oak	553,762	262,298	194,925	38,121	58,418
Other red oak	64,865	24,902	23,179	4,696	12,088
Hickory	14,215	10,497	3,254	464	--
Basswood	42,814	27,505	11,413	--	3,896
Yellow birch	8,410	4,227	1,907	2,276	--
Hard maple	90,901	55,560	11,305	2,653	21,383
Soft maple	107,826	40,760	39,245	3,168	24,653
Elm	109,997	55,640	32,587	14,254	7,516
Black ash	57,388	40,867	16,521	--	--
White and green ash	77,819	57,542	12,804	5,201	2,272
Cottonwood	22,358	4,750	5,002	--	12,606
Willow	73,980	24,441	26,657	5,372	17,510
Hackberry	2,525	2,525	--	--	--
Balsam poplar	95,238	78,380	12,502	4,356	--
Bigtooth aspen	77,871	58,374	19,497	--	--
Quaking aspen	749,507	602,154	133,991	7,370	5,992
Paper birch	133,984	106,011	22,608	3,778	1,587
Black cherry	5,097	5,097	--	--	--
Black walnut	4,069	2,478	--	1,591	--
Butternut	9,768	9,768	--	--	--
Other hardwoods	40,670	19,807	20,863	--	--
Total	2,995,151	1,812,615	795,646	152,694	234,196
All species	3,123,478	1,837,571	809,468	164,474	311,965

Table 56.--Net volume of short-log trees on timberland by species group and diameter class, Minnesota, 1990

(In thousand cubic feet)

Species group	All classes	Diameter class (inches at breast height) 9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods									
Jack pine	3,513	538	1,096	889	634	279	77	--	--
Red pine	1,693	444	563	219	133	--	--	334	--
White pine	2,167	261	370	277	212	246	191	329	281
White spruce	562	70	65	142	138	147	--	--	--
Black spruce	445	246	87	--	112	--	--	--	--
Balsam fir	2,544	750	1,472	322	--	--	--	--	--
Tamarack	2,855	630	1,366	456	117	102	--	184	--
Eastern redcedar	268	115	--	--	--	153	--	--	--
Northern white-cedar	17,243	5,019	4,916	3,357	1,887	1,076	718	187	83
Other softwoods	479	117	--	--	--	--	--	63	299
Total	31,769	8,190	9,935	5,662	3,233	2,003	986	1,097	663
Hardwoods									
Select white oak	61,070	--	10,078	8,870	8,454	9,192	5,524	13,710	5,242
Select red oak	32,220	--	3,711	5,511	5,106	4,686	3,829	8,237	1,140
Other red oak	3,845	--	929	1,011	186	438	399	767	115
Hickory	1,177	--	350	362	--	273	89	103	--
Basswood	19,147	--	3,078	2,974	3,860	2,563	1,341	5,031	300
Yellow birch	1,947	--	480	399	206	318	201	343	--
Hard maple	17,586	--	2,388	3,335	4,498	2,273	2,717	2,159	216
Soft maple	12,545	--	2,220	1,533	1,373	992	796	2,619	3,012
Elm	14,738	--	2,856	2,156	2,711	1,436	1,651	2,192	1,736
Black ash	5,544	--	2,429	1,550	676	480	108	301	--
White and green ash	10,193	--	1,952	1,900	1,135	1,894	629	2,053	630
Cottonwood	1,395	--	--	--	--	76	--	493	826
Willow	3,160	--	696	375	122	480	447	542	498
Hackberry	1,420	--	121	349	392	148	--	410	--
Balsam poplar	3,078	--	511	1,298	548	--	426	182	113
Bigtooth aspen	3,359	--	510	1,016	778	244	712	99	--
Quaking aspen	49,232	--	7,895	14,871	11,477	8,506	2,999	3,352	132
Paper birch	17,806	--	7,131	4,942	3,281	1,206	911	232	103
River birch	89	--	--	--	--	89	--	--	--
Black cherry	723	--	356	106	261	--	--	--	--
Black walnut	988	--	171	155	399	--	195	68	--
Butternut	1,397	--	150	334	201	583	--	129	--
Other hardwoods	7,349	--	2,120	2,082	1,528	708	362	549	--
Total	270,008	--	50,132	55,129	47,192	36,585	23,336	43,571	14,063
All species	301,777	8,190	60,067	60,791	50,425	38,588	24,322	44,668	14,726

Table 57.--Net volume of short-log trees on timberland by species group and diameter class, Minnesota, 1990

(In thousand board feet) [1]

Species group	All classes	Diameter class (inches at breast height) 9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods									
Jack pine	12,089	1,744	3,672	3,083	2,272	1,027	291	--	--
Red pine	6,437	1,600	2,079	841	524	--	--	1,393	--
White pine	7,513	811	1,176	911	724	879	684	1,228	1,100
White spruce	2,745	320	301	680	688	756	--	--	--
Black spruce	1,450	777	288	--	385	--	--	--	--
Balsam fir	7,216	2,082	4,186	948	--	--	--	--	--
Tamarack	11,813	2,500	5,582	1,907	506	455	--	863	--
Eastern redcedar	1,268	510	--	--	--	758	--	--	--
Northern white-cedar	60,197	17,104	16,825	11,724	6,791	3,985	2,703	727	338
Other softwoods	2,817	514	--	--	--	--	--	322	1,981
Total	113,545	27,962	34,109	20,094	11,890	7,860	3,678	4,533	3,419
Hardwoods									
Select white oak	150,198	--	21,885	20,506	20,370	22,784	14,054	36,109	14,490
Select red oak	69,344	--	6,939	11,131	10,735	10,217	8,516	19,035	2,771
Other red oak	8,418	--	1,778	2,156	409	984	927	1,869	295
Hickory	2,657	--	683	810	--	671	224	269	--
Basswood	40,398	--	5,784	5,980	8,084	5,499	2,930	11,412	709
Yellow birch	4,673	--	1,048	926	497	785	505	912	--
Hard maple	39,690	--	4,766	7,160	10,145	5,289	6,435	5,335	560
Soft maple	32,869	--	4,865	3,685	3,438	2,579	2,104	7,212	8,986
Elm	37,782	--	6,386	5,178	6,845	3,756	4,436	6,114	5,067
Black ash	12,590	--	5,271	3,520	1,597	1,172	262	768	--
White and green ash	22,338	--	3,767	3,978	2,469	4,257	1,448	4,869	1,550
Cottonwood	5,236	--	--	--	--	254	--	1,785	3,197
Willow	10,401	--	1,886	1,106	394	1,568	1,494	1,948	2,005
Hackberry	3,680	--	275	850	1,004	393	--	1,158	--
Balsam poplar	7,554	--	1,155	3,097	1,371	--	1,109	490	332
Bigtooth aspen	5,545	--	756	1,643	1,302	421	1,248	175	--
Quaking aspen	104,585	--	15,402	30,875	24,703	18,779	6,755	7,754	317
Paper birch	41,175	--	15,528	11,495	7,940	3,006	2,314	609	283
River birch	319	--	--	--	--	319	--	--	--
Black cherry	1,548	--	719	237	592	--	--	--	--
Black walnut	2,305	--	351	354	940	--	488	172	--
Butternut	3,282	--	310	763	469	1,417	--	323	--
Other hardwoods	21,808	--	5,851	6,130	4,665	2,206	1,158	1,798	--
Total	628,395	--	105,405	121,580	107,969	86,356	56,407	110,116	40,562
All species	741,940	27,962	139,514	141,674	119,859	94,216	60,085	114,649	43,981

[1] International 1/4-inch rule.

Table 58.--Average net annual growth of growing stock and sawtimber on timberland by softwoods and hardwoods and Forest Survey Unit, Minnesota, 1976 and 1977-1989

Forest Survey Unit	Growing stock		Sawtimber	
	1976	1977-1989	1976	1977-1989
	In thousand cubic feet		*In thousand board feet* [1]	
Aspen-Birch				
Softwoods	41,407	55,822	129,982	211,461
Hardwoods	61,154	76,598	161,785	235,800
Total	102,561	132,420	291,767	447,261
Northern Pine				
Softwoods	36,461	50,887	124,659	200,012
Hardwoods	109,996	119,488	322,540	406,360
Total	146,457	170,375	447,199	606,372
Central Hardwood				
Softwoods	3,521	5,515	10,251	20,390
Hardwoods	51,510	47,922	155,903	194,779
Total	55,031	53,437	166,153	215,169
Prairie				
Softwoods	48	477	120	991
Hardwoods	10,793	11,260	23,431	40,603
Total	10,841	11,737	23,551	41,594
All Units				
Softwoods	81,437	112,701	265,012	432,854
Hardwoods	233,453	255,268	663,659	877,542
Total	314,890	367,969	928,671	1,310,396

[1] International 1/4-inch rule.

Table 59.--Average net annual growth of growing stock on timberland by species group and ownership class, Minnesota, 1977-1989

(In thousand cubic feet)

Species group	All owners	Ownership class									
		National forest	Bureau of Land Mgmt.	Misc. federal	State	County & municipal	Indian	Forest industry	Farmer	Misc. private corporation	Misc. private individual
Softwoods											
Jack pine	11,012	1,382	43	77	1,438	2,016	133	1,759	1,047	327	2,790
Red pine	23,687	7,629	43	217	3,917	3,177	639	1,780	1,078	418	4,789
White pine	8,767	2,562	--	183	921	1,163	534	248	747	497	1,912
White spruce	12,800	4,067	43	82	2,334	2,123	247	974	561	383	1,986
Black spruce	11,515	2,015	54	84	3,244	2,147	485	817	580	518	1,571
Balsam fir	17,030	2,836	23	78	2,783	3,107	307	1,409	1,281	1,176	4,030
Tamarack	12,328	795	10	127	4,994	2,103	749	308	820	323	2,099
Eastern redcedar	649	--	--	--	62	15	--	--	366	--	206
Northern white-cedar	14,700	2,000	77	226	6,312	2,058	1,013	1,192	267	496	1,059
Other softwoods	213	--	--	--	1	--	--	--	33	46	133
Total	112,701	23,286	293	1,074	26,006	17,909	4,107	8,487	6,780	4,184	20,575
Hardwoods											
Select white oak	14,845	369	3	235	1,164	1,214	391	125	6,318	516	4,510
Other white oak	17,864	379	--	496	1,961	2,554	228	162	5,881	643	5,560
Select red oak	417	8	--	51	26	-63	5	--	291	-13	112
Hickory	879	--	--	3	35	-4	2	--	559	24	260
Basswood	17,576	1,347	--	365	1,794	3,203	401	539	4,175	482	5,270
Yellow birch	104	95	--	--	24	9	--	--	--	1	-25
Hard maple	12,365	1,400	13	172	1,681	3,362	317	466	1,859	479	2,616
Soft maple	14,995	1,797	--	662	2,085	3,135	251	627	1,640	834	3,964
Elm	-10,809	-352	-4	-427	-1,079	-1,239	255	-465	-4,512	-370	-2,616
Black ash	18,585	1,117	28	147	2,844	4,114	686	621	2,656	816	5,556
White and green ash	6,916	212	18	258	668	485	94	112	2,948	300	1,821
Cottonwood	1,205	2	--	150	154	69	--	--	713	10	107
Willow	506	--	--	27	-85	14	--	6	275	19	250
Hackberry	406	--	--	6	4	--	--	--	260	46	90
Balsam poplar	9,292	235	18	106	2,555	1,179	517	629	1,879	313	1,861
Bigtooth aspen	8,359	1,186	4	19	1,031	1,559	199	231	983	273	2,874
Quaking aspen	114,996	14,069	38	1,078	19,451	22,817	3,753	6,253	14,157	5,222	28,158
Paper birch	23,388	4,765	2	28	2,971	5,850	610	1,071	1,467	1,295	5,329
River birch	3	--	--	2	--	--	--	--	1	--	--
Black cherry	408	21	--	3	17	20	--	-6	251	22	80
Black walnut	465	--	--	--	34	1	--	--	269	26	135
Butternut	689	--	--	--	53	--	--	4	548	6	78
Other hardwoods	1,814	--	--	15	145	46	-2	9	1,223	26	352
Total	255,268	26,650	120	3,396	37,533	48,325	7,707	10,384	43,841	10,970	66,342
All species	367,969	49,936	413	4,470	63,539	66,234	11,814	18,871	50,621	15,154	86,917

Table 60--Average net annual growth of sawtimber on timberland by species group and ownership class, Minnesota, 1977-1989

(In thousand board feet)[1]

Species group	All owners	Ownership class									
		National forest	Bureau of Land Mgmt.	Misc. federal	State	County & municipal	Indian	Forest industry	Farmer	Misc. private corporation	Misc. private individual
Softwoods											
Jack pine	47,913	5,988	534	403	6,324	9,443	348	4,851	5,179	1,049	13,794
Red pine	93,295	34,139	347	1,062	14,482	12,819	3,295	5,866	4,185	2,079	15,021
White pine	48,084	14,518	--	931	5,040	6,111	2,430	1,423	3,759	3,344	10,528
White spruce	52,033	15,245	125	419	9,111	9,597	1,025	3,972	2,395	2,006	8,138
Black spruce	24,474	7,839	13	259	6,685	3,228	407	1,134	955	1,202	2,752
Balsam fir	65,423	13,781	39	232	7,362	13,523	1,941	4,473	4,648	3,579	15,845
Tamarack	38,032	5,271	66	366	12,169	4,707	2,262	907	4,094	1,094	7,096
Eastern redcedar	1,433	--	--	--	--	--	--	--	1,071	--	362
Northern white-cedar	61,048	11,018	291	370	21,416	10,127	3,777	5,649	1,257	2,604	4,539
Other softwoods	1,119	--	--	--	--	--	--	--	118	541	460
Total	432,854	107,799	1,415	4,042	82,589	69,555	15,485	28,275	27,661	17,498	78,535
Hardwoods											
Select white oak	58,508	648	2	1,019	3,862	2,697	812	193	31,145	2,032	16,098
Other white oak	91,418	1,049	--	2,817	10,820	10,613	1,124	530	33,985	3,290	27,190
Select red oak	3,469	31	--	109	317	234	21	--	1,721	-59	1,095
Hickory	2,181	--	--	14	139	6	12	--	1,310	23	677
Basswood	59,097	4,289	--	1,136	5,509	8,539	1,726	2,130	17,266	1,588	16,914
Yellow birch	1,034	563	--	--	38	235	--	21	-6	25	158
Hard maple	25,107	3,475	--	399	3,065	4,848	624	847	5,930	761	5,158
Soft maple	21,470	1,435	--	3,557	2,498	2,912	20	588	3,814	1,485	5,161
Elm	-38,127	-342	3	-620	-2,626	-3,819	125	-1,436	-18,729	-728	-9,955
Black ash	39,105	2,249	85	468	5,416	8,831	810	1,310	6,428	1,293	12,215
White and green ash	22,714	572	53	889	2,101	1,128	146	276	10,551	1,009	5,989
Cottonwood	6,717	--	--	703	771	270	--	--	4,269	196	508
Willow	2,918	--	--	379	-158	19	--	29	1,329	169	1,151
Hackberry	531	--	--	--	--	--	--	--	398	5	128
Balsam poplar	30,434	3,287	-14	322	5,946	5,738	1,185	2,257	6,185	804	4,724
Bigtooth aspen	39,051	4,368	40	117	5,457	7,551	660	1,024	5,554	935	13,345
Quaking aspen	441,397	63,917	643	4,194	68,602	100,684	16,550	20,909	45,399	20,589	99,910
Paper birch	61,853	12,147	16	612	7,574	13,338	2,032	2,207	4,958	2,974	15,995
Black cherry	1,506	--	--	--	221	6	--	--	1,113	50	116
Black walnut	1,685	--	--	--	200	6	--	--	1,018	113	348
Butternut	3,130	--	--	2	137	--	--	21	2,178	92	700
Other hardwoods	2,344	--	--	23	201	33	-9	--	1,564	61	471
Total	877,542	97,688	828	16,140	120,090	163,869	25,838	30,906	167,380	36,707	218,096
All species	1,310,396	205,487	2,243	20,182	202,679	233,424	41,323	59,181	195,041	54,205	296,631

[1]International 1/4-inch rule

Table 61.--Average net annual growth of growing stock on timberland by species group and forest type, Minnesota, 1977-1989

(In thousand cubic feet)

Species group	All types	Forest type														
		Jack pine	Red pine	White pine	Balsam fir	White spruce	Black spruce	Northern white-cedar	Tamarack	Oak-hickory	Elm-ash-soft maple	Maple-basswood	Aspen	Paper birch	Balsam poplar	Non-stocked
Softwoods																
Jack pine	11,012	8,107	633	-18	58	143	289	-1	91	391	-18	37	1,313	-56	18	25
Red pine	23,687	1,668	15,351	420	609	168	209	17	63	451	19	347	3,538	716	109	2
White pine	8,767	296	1,032	2,303	645	114	164	62	65	255	31	1,045	2,005	727	23	--
White spuce	12,800	454	458	149	2,293	2,651	283	-53	102	119	323	401	4,616	753	248	3
Black spruce	11,515	153	65	24	785	124	9,628	-979	673	-7	-16	7	986	73	2	-3
Balsam fir	17,030	430	328	9	5,831	-207	620	-1,696	163	34	311	-199	9,779	1,471	182	-26
Tamarack	12,328	20	17	8	308	-4	2,641	362	8,232	1	-10	5	404	138	129	77
Eastern redcedar	649	--	--	--	--	--	14	--	--	430	7	127	48	23	--	--
Northern white-cedar	14,700	--	35	26	827	75	481	10,545	437	--	740	201	667	487	179	--
Other softwoods	213	139	--	--	--	11	--	--	--	24	--	--	39	--	--	--
Total	112,701	11,267	17,919	2,921	11,356	3,075	14,329	8,257	9,826	1,698	1,387	1,971	23,395	4,332	890	78
Hardwoods																
Select white oak	14,845	69	45	12	41	3	--	1	11	7,457	918	2,111	3,845	288	39	5
Select red oak	17,864	70	45	3	5	--	4	--	31	11,300	189	1,871	3,529	777	40	--
Other red oak	417	--	-24	--	--	--	--	--	--	283	11	18	83	39	7	--
Hickory	879	--	--	--	--	--	--	--	--	690	17	157	7	8	--	--
Basswood	17,576	17	26	7	23	--	--	3	8	1,901	811	10,246	3,983	477	74	--
Yellow birch	104	--	--	--	8	18	--	-21	--	15	-39	72	54	-5	2	--
Hard maple	12,365	--	32	20	29	-3	3	13	--	838	439	7,954	2,230	754	56	--
Soft maple	14,995	66	76	119	296	51	83	-3	30	691	2,343	3,012	6,828	1,351	52	--
Elm	-10,809	-7	-11	-17	-43	--	13	-33	27	-340	-5,162	-3,785	-971	-78	-382	-20
Black ash	18,585	6	8	1	306	8	31	167	136	324	11,244	1,448	3,477	668	727	34
White and green ash	6,916	--	6	1	3	6	--	-20	--	588	1,797	3,446	946	99	38	6
Cottonwood	1,205	--	-7	--	--	--	2	--	--	184	1,025	11	-34	5	--	19
Willow	506	--	31	--	--	--	--	--	--	16	434	53	-28	--	--	--
Hackberry	406	--	--	--	--	--	--	--	--	176	91	139	--	--	--	--
Balsam poplar	9,292	5	3	13	318	5	56	-126	81	19	-60	-147	3,848	257	4,949	71
Bigtooth aspen	8,359	146	137	3	22	--	12	23	6	500	12	598	6,507	387	6	--
Quaking aspen	114,996	1,394	555	67	2,507	378	1,429	74	279	2,074	1,653	2,008	97,306	3,200	2,120	-48
Paper birch	23,388	465	343	117	1,084	106	237	-108	77	459	56	871	10,275	9,148	238	20
River birch	3	--	--	--	--	--	--	--	--	--	3		--	--	--	--
Black cherry	408	--	--	--	--	--	--	--	--	106	-3	222	56	37	-10	--
Black walnut	465	--	--	--	--	--	--	--	--	332	91	40	2	--	--	--
Butternut	689	--	--	--	--	--	--	--	--	521	59	102	7	--	--	--
Other hardwoods	1,814	--	--	--	--	--	--	--	--	311	870	483	106	11	33	--
Total	255,268	2,231	1,265	346	4,599	572	1,870	-30	686	28,445	16,799	30,930	142,056	17,423	7,989	87
All species	367,969	13,498	19,184	3,267	15,955	3,647	16,199	8,227	10,512	30,143	18,186	32,901	165,451	21,755	8,879	165

Table 62.--Average net annual growth of sawtimber on timberland by species group and forest type, Minnesota, 1977-1989

(In thousand board feet)[1]

Species group	All types	Forest type														
		Jack pine	Red pine	White pine	Balsam fir	White spruce	Black spruce	Northern white-cedar	Tamarack	Oak-hickory	Elm-ash-soft maple	Maple-basswood	Aspen	Paper birch	Balsam poplar	Non-stocked
Softwoods																
Jack pine	47,913	33,953	1,907	277	-114	372	656	46	339	2,173	-55	464	7,723	-71	68	175
Red pine	93,295	7,081	58,074	2,201	2,532	545	642	98	252	2,013	112	1,195	15,101	3,057	380	12
White pine	48,084	1,310	5,680	12,300	3,591	838	761	360	336	1,462	217	5,963	11,242	3,915	109	--
White spuce	52,033	2,130	1,429	657	8,601	6,371	1,098	-133	44	648	1,870	2,072	22,214	3,564	1,447	21
Black spruce	24,474	625	139	87	3,896	293	15,459	-1,589	1,142	-38	123	79	4,078	176	3	1
Balsam fir	65,423	1,638	1,161	260	18,787	204	1,888	-2,284	761	90	2,098	-665	34,237	5,643	1,605	--
Tamarack	38,032	19	43	--	1,703	-20	6,327	1,739	23,836	6	1,238	-1	1,531	631	743	237
Eastern redcedar	1,433	--	--	--	--	--	--	--	--	905	36	292	128	72	--	--
Northern white-cedar	61,048	--	110	94	4,985	276	1,278	40,882	1,675	--	4,026	1,076	3,651	2,060	934	1
Other softwoods	1,119	823	--	--	--	--	--	--	--	105	--	--	191	--	--	--
Total	432,854	47,579	68,543	15,876	43,981	8,879	28,109	39,119	28,385	7,364	9,665	10,475	100,096	19,047	5,289	447
Hardwoods																
Select white oak	58,508	126	48	53	154	--	--	7	--	35,710	2,277	10,004	9,406	624	73	26
Select red oak	91,418	205	53	10	28	--	71	--	123	60,765	606	10,672	15,560	3,151	174	--
Other red oak	3,469	--	47	--	--	--	--	--	--	2,541	12	251	385	196	37	--
Hickory	2,181	--	--	--	--	--	--	--	--	1,762	--	361	10	48	--	--
Basswood	59,097	--	--	28	107	--	--	15	22	5,992	3,034	40,114	8,359	1,286	140	--
Yellow birch	1,034	--	--	--	171	41	2	-46	--	--	52	657	45	112	--	--
Hard maple	25,107	--	--	34	35	-20	--	2	--	1,083	975	20,397	1,879	673	49	--
Soft maple	21,470	--	--	223	311	12	186	130	69	1,221	9,259	4,525	4,829	626	79	--
Elm	-38,127	--	--	16	-108	--	39	-147	11	-1,572	-17,152	-16,900	-984	-312	-1,018	--
Black ash	39,105	--	--	35	375	1	--	224	93	788	26,231	4,023	5,192	1,121	1,004	18
White and green ash	22,714	--	32	6	--	--	--	-28	--	2,284	6,380	11,994	1,517	319	180	30
Cottonwood	6,717	--	--	--	--	--	--	--	--	1,051	5,321	159	-3	24	--	165
Willow	2,918	--	--	--	--	--	--	--	--	5	2,768	130	15	--	--	--
Hackberry	531	--	--	--	--	--	--	--	--	240	102	189	--	--	--	--
Balsam poplar	30,434	--	65	28	1,148	29	78	-496	51	-102	1,629	390	11,421	1,898	14,136	159
Bigtooth aspen	39,051	181	718	28	91	--	--	42	33	2,448	267	2,496	30,633	2,114	--	--
Quaking aspen	441,397	3,821	2,288	418	9,359	1,492	3,989	131	1,471	10,597	7,703	12,769	366,669	15,290	5,319	81
Paper birch	61,853	907	915	625	2,588	-135	393	187	344	2,602	919	6,268	23,429	22,337	448	26
Black cherry	1,506	--	--	--	--	--	--	--	--	492	248	745	21	--	--	--
Black walnut	1,685	--	--	--	--	--	--	--	--	1,328	202	124	26	5	--	--
Butternut	3,130	--	--	--	--	--	--	--	--	2,238	100	643	148	1	--	--
Other hardwoods	2,344	--	--	--	--	--	--	--	--	275	1,721	319	29	--	--	--
Total	877,542	5,240	4,166	1,504	14,259	1,420	4,758	21	2,217	131,748	52,654	110,330	478,586	49,513	20,621	505
All species	1,310,396	52,819	72,709	17,380	58,240	10,299	32,867	39,140	30,602	139,112	62,319	120,805	578,682	68,560	25,910	952

[1] International 1/4-inch rule.

Table 63.--Current annual growth, mortality, and removals of growing stock and sawtimber on timberland by species group, Minnesota, 1989

Species group	Growing stock			Sawtimber		
	1989 Net growth[1]	1989 Mortality	1988 Removals[2]	1989 Net growth[1]	1989 Mortality	1988 Removals[2]
	Thousand cubic feet			*Thousand board feet*[3]		
Softwoods						
Jack pine	10,436	11,229	15,506	48,712	37,698	55,730
Red pine	26,585	87	11,380	104,828	1,064	53,683
White pine	11,067	186	4,110	59,568	2,419	22,412
White spruce	16,488	1,593	3,877	69,984	6,824	9,893
Black spruce	11,204	15,092	9,825	26,419	15,160	25,066
Balsam fir	22,988	28,300	14,984	96,514	50,881	35,531
Tamarack	13,045	4,913	1,110	46,437	7,066	2,271
Eastern redcedar	778	3	--	2,430	18	--
Northern white-cedar	17,018	1,080	2,423	64,102	7,272	4,302
Other softwoods	184	2	--	1,069	15	--
Total	129,793	62,485	63,215	520,063	128,417	208,888
Hardwoods						
Select white oak	18,580	154	4,898	65,005	2,413	15,104
Select red oak	20,077	7,596	11,867	102,714	23,372	42,671
Other red oak	862	287	--	5,058	517	--
Hickory	895	74	--	2,097	146	--
Basswood	20,760	3,455	4,253	67,682	11,160	19,174
Yellow birch	188	343	65	791	1,136	313
Hard maple	15,527	962	1,807	28,502	3,146	4,495
Soft maple	19,254	3,612	1,879	30,398	2,906	4,572
Elm	6,829	8,064	4,571	10,209	20,382	13,264
Black ash	21,812	4,595	3,358	44,036	7,737	10,162
White and green ash	8,712	524	1,023	30,764	1,298	3,095
Cottonwood	1,332	118	1,189	7,234	568	4,802
Willow	577	291	--	3,122	1,010	--
Hackberry	537	46	--	525	169	--
Balsam poplar	13,947	14,188	5,072	51,388	28,499	11,866
Bigtooth aspen	9,868	3,218	9,812	47,452	8,287	27,301
Quaking aspen	127,036	75,112	134,252	515,305	164,672	373,534
Paper birch	29,376	20,255	12,455	82,972	21,202	34,286
River birch	2	--	--	--	--	--
Black cherry	808	21	--	1,435	64	--
Black walnut	452	7	--	1,990	117	--
Butternut	1,367	47	--	3,586	135	--
Other hardwoods	2,740	1,074	1,101	2,883	1,687	2,910
Total	321,538	144,043	197,602	1,105,148	300,623	567,549
All species	451,331	206,528	260,817	1,625,211	429,040	776,437

[1]An estimate of current gross growth may be computed by adding current mortality to current net growth.

[2]Based on data from a 1988 mill survey and a 1989-1990 logging utilization study and on land-use change estimates from the new inventory.

[3]International 1/4-inch rule.

Table 64.--Average annual timber removals from growing stock and sawtimber on timberland by softwoods and hardwoods and Forest Survey Unit, Minnesota, 1976 and 1977-1989

Species group	Growing stock		Sawtimber	
	1976	1977-1989	1976	1977-1989
	In thousand cubic feet		*In thousand board feet* [1]	
Aspen-Birch				
Softwoods	38,803	32,189	93,268	86,092
Hardwoods	38,445	50,168	84,758	93,089
Total	77,248	82,357	178,026	179,181
Northern Pine				
Softwoods	28,502	22,237	73,651	74,226
Hardwoods	44,926	68,513	108,755	146,153
Total	73,428	90,750	182,406	220,379
Central Hardwood				
Softwoods	1,339	471	2,766	1,591
Hardwoods	32,858	29,289	79,236	95,365
Total	34,197	29,760	82,002	96,956
Prairie				
Softwoods	156	22	257	--
Hardwoods	8,571	7,173	17,616	18,834
Total	8,727	7,195	17,873	18,834
All Units				
Softwoods	68,800	54,919	169,942	161,909
Hardwoods	124,800	155,143	290,365	353,441
All species	193,600	210,062	460,307	515,350

[1] International 1/4-inch rule.

Table 65.--Average annual mortality of growing stock and sawtimber on timberland by softwoods and hardwoods, Minnesota, 1976 and 1977-1989[1]

Species group	Growing stock		Sawtimber	
	1976	1977-1989	1976	1977-1989
	In thousand cubic feet		*In thousand board feet*[2]	
Softwoods	47,641	66,235	86,960	141,877
Hardwoods	121,725	152,993	216,308	309,853
All species	169,366	219,228	303,268	451,730

[1] Adjusted estimates of current annual mortality in 1976 and average annual mortality 1977-1989.

[2] International 1/4-inch rule.

Table 66.--Average annual mortality of growing stock on timberland by species group and cause of death, Minnesota, 1977-1989

(In thousand cubic feet)

Species group	All causes	Cause of death							
		Insects	Disease	Fire	Animals	Weather	Suppression	Other and unknown	Logging/ mechanical
Softwoods									
Jack pine	10,308	773	2,808	306	1,305	1,180	143	3,525	268
Red pine	386	108	15	24	--	71	10	129	28
White pine	873	47	353	29	50	141	1	248	4
White spruce	2,048	488	224	25	11	712	8	463	117
Black spruce	14,076	824	3,049	332	90	5,515	92	3,967	207
Balsam fir	32,234	10,328	4,774	698	329	9,147	158	5,763	1,036
Tamarack	4,452	188	1,020	314	339	1,258	2	1,307	25
Eastern redcedar	30	--	--	--	--	--	--	21	9
Northern white-cedar	1,828	13	604	10	--	653	21	451	77
Total	66,235	13,645	12,621	1,692	1,929	18,668	422	15,420	1,839
Hardwoods									
Select white oak	993	18	144	337	56	31	6	357	43
Select red oak	6,990	184	3,029	664	16	571	52	2,257	217
Other red oak	480	--	168	74	--	68	--	170	--
Hickory	75	--	44	--	--	--	--	17	14
Basswood	3,091	17	745	314	93	306	--	1,388	229
Yellow birch	278	--	154	19	--	23	--	82	--
Hard maple	1,071	--	543	41	50	211	--	181	45
Soft maple	2,219	3	950	183	35	574	--	377	97
Elm	25,971	117	22,692	314	40	632	--	2,020	155
Black ash	3,787	18	1,198	251	111	818	18	1,270	104
White and green ash	510	--	106	53	25	--	--	319	7
Cottonwood	332	1	34	146	7	--	--	144	--
Willow	351	--	26	132	--	20	--	170	3
Hackberry	92	--	--	15	6	--	--	47	25
Balsam poplar	14,937	114	4,796	711	421	3,892	30	4,626	346
Bigtooth aspen	2,600	39	1,585	159	51	221	4	541	--
Quaking aspen	67,100	870	42,241	2,276	2,150	8,225	237	10,166	935
Paper birch	20,984	382	7,317	572	194	1,685	77	10,083	674
Black cherry	132	--	17	9	--	--	1	105	--
Black walnut	20	--	--	--	--	--	--	20	--
Butternut	104	--	95	--	--	--	--	9	--
Other hardwoods	876	12	82	211	12	7	--	515	36
Total	152,993	1,701	89,282	6,211	3,083	16,440	395	33,116	2,765
All species	219,228	14,719	103,166	7,951	4,984	34,548	805	48,483	4,573

Table 67.--Average annual mortality of sawtimber on timberland by species group and cause of death, Minnesota, 1977-1989

(In thousand board feet)[1]

Species group	All causes	Cause of death							
		Insects	Disease	Fire	Animals	Weather	Suppression	Other and unknown	Logging/ mechanical
Softwoods									
Jack pine	33,831	2,696	9,283	1,189	5,009	3,837	45	11,488	284
Red pine	2,007	601	103	87	18	452	--	675	71
White pine	4,936	266	1,908	178	316	824	5	1,437	2
White spruce	8,541	1,926	1,069	130	2	3,273	2	1,849	290
Black spruce	15,741	837	2,944	57	144	7,719	--	3,949	91
Balsam fir	61,956	14,522	13,109	1,757	687	20,578	85	10,178	1,040
Tamarack	7,672	458	1,629	714	397	1,893	--	2,531	50
Eastern redcedar	52	--	--	--	--	--	--	52	--
Northern white-cedar	7,144	37	3,122	54	4	2,497	--	1,379	51
Total	141,880	21,343	33,167	4,166	6,577	41,073	137	33,538	1,879
Hardwoods									
Select white oak	3,358	42	410	1,597	65	85	--	1,093	66
Select red oak	18,423	316	8,784	2,113	53	1,269	--	5,511	377
Other red oak	1,254	--	561	303	2	12	--	376	--
Hickory	145	--	56	--	--	--	--	88	1
Basswood	8,876	33	2,372	1,463	164	714	--	3,756	374
Yellow birch	862	--	602	--	--	84	--	176	--
Hard maple	2,562	--	1,330	170	28	788	--	229	17
Soft maple	2,069	--	966	260	4	344	--	491	4
Elm	72,027	371	64,049	277	101	1,663	--	5,227	339
Black ash	6,074	46	2,611	333	72	1,499	--	--	--
White and green ash	932	1	81	88	63	6	--	690	3
Cottonwood	1,180	--	122	601	1	--	--	456	--
Willow	1,035	--	124	441	--	--	--	456	14
Hackberry	348	--	--	61	--	--	--	189	98
Balsam poplar	30,397	198	11,601	1,446	252	8,894	--	7,593	413
Bigtooth aspen	5,163	36	3,535	311	10	436	--	835	--
Quaking aspen	132,762	1,244	94,594	3,793	2,857	16,390	64	12,749	1,071
Paper birch	20,592	233	9,768	297	68	1,565	--	8,269	392
Black cherry	178	--	--	--	2	--	--	176	--
Black walnut	131	--	2	5	--	--	--	122	2
Butternut	138	--	136	--	--	--	--	2	--
Other hardwoods	1,350	--	189	18	--	--	--	1,097	46
Total	309,856	2,520	201,893	13,577	3,742	33,749	64	51,094	3,217
All species	451,736	23,863	235,060	17,743	10,319	74,822	201	84,632	5,096

[1]International 1/4-rule.

Table 68.--Current annual timber removals of growing stock and sawtimber on timberland by species group and item, Minnesota, 1988

Species group	All removals	All products removals	Removals for products (Item)									Other	
			Sawlogs	Veneer logs	Coop-erage	Pulp-wood[1]	Piling	Poles	Fuelwood	Posts	Misc. products	Logging residue	Other removals
GROWING STOCK													
	Thousand cubic feet												
Softwoods													
Jack pine	15,506	14,301	6,783	--	--	6,692	27	40	210	270	279	795	410
Red pine	11,380	10,600	7,266	--	--	1,906	502	347	175	329	75	424	356
White pine	4,110	3,580	3,408	2	--	147	--	3	13	4	3	99	431
Spruce	13,702	12,466	1,447	--	--	11,011	--	--	7	--	1	360	876
Balsam fir	14,984	13,703	809	--	--	12,889	--	--	3	--	2	346	935
Tamarack	1,110	896	48	--	--	809	--	--	29	10	--	20	194
Cedar	2,423	1,923	436	--	--	--	--	--	--	1,487	--	69	431
Total	63,215	57,469	20,197	2	--	33,454	529	390	437	2,100	360	2,113	3,633
Hardwoods													
White oak	4,898	2,590	1,266	24	37	--	--	--	1,263	--	--	417	1,891
Red oak	11,867	8,285	5,926	144	1	--	--	--	2,214	--	--	1,903	1,679
Basswood	4,253	2,567	2,265	260	3	--	--	--	39	--	--	577	1,109
Yellow birch	65	51	47	4	--	--	--	--	--	--	--	11	3
Hard maple	1,807	1,203	255	8	--	--	--	--	910	--	30	62	542
Soft maple	1,879	1,464	375	52	--	411	--	--	575	--	51	114	301
Elm	4,571	2,481	1,276	19	--	--	--	--	1,186	--	--	301	1,789
Ash	4,381	2,418	1,496	72	--	162	--	--	688	--	--	364	1,599
Cottonwood	1,189	692	626	52	--	--	--	--	14	--	--	158	339
Balsam poplar	5,072	3,552	79	--	--	3,473	--	--	--	--	--	198	1,322
Aspen	144,064	131,237	14,582	556	--	112,386	--	--	1,252	--	2,461	7,906	4,921
Paper birch	12,455	10,332	2,070	1,159	--	975	--	--	5,892	--	236	802	1,321
Other hardwoods	1,101	272	223	14	--	--	--	--	35	--	--	51	778
Total	197,602	167,144	30,486	2,364	41	117,407	--	--	14,068	--	2,778	12,864	17,594
All species	260,817	224,613	50,683	2,366	41	150,861	529	390	14,505	2,100	3,138	14,977	21,227
SAWTIMBER													
	Thousand board feet[2]												
Softwoods													
Jack pine	55,730	53,367	30,966	--	--	20,757	123	116	388	115	902	1,317	1,046
Red pine	53,683	51,290	41,360	--	--	5,903	2,316	1,000	328	140	243	637	1,756
White pine	22,412	19,916	19,391	13	--	464	--	12	26	1	9	170	2,326
Spruce	34,959	32,361	6,617	--	--	25,728	--	--	13	--	3	762	1,836
Balsam fir	35,531	33,833	3,710	--	--	30,112	--	--	5	--	6	747	951
Tamarack	2,271	2,173	225	--	--	1,891	--	--	53	4	--	45	53
Cedar	4,302	2,644	2,003	--	--	--	--	--	1	640	--	71	1,587
Total	208,888	195,584	104,272	13	--	84,855	2,439	1,128	814	900	1,163	3,749	9,555
Hardwoods													
White oak	15,104	9,462	6,706	149	280	--	--	--	2,327	--	--	564	5,078
Red oak	42,671	36,249	31,222	936	10	--	--	--	4,081	--	--	2,455	3,967
Basswood	19,174	14,289	12,522	1,676	18	--	--	--	73	--	--	674	4,211
Yellow birch	313	299	265	34	--	--	--	--	--	--	--	14	--
Hard maple	4,495	3,316	1,423	58	--	--	--	--	1,680	--	155	99	1,080
Soft maple	4,572	4,186	2,081	345	--	424	--	--	1,073	--	263	159	227
Elm	13,264	9,404	7,091	133	--	--	--	--	2,180	--	--	347	3,513
Ash	13,257	10,244	8,296	470	--	208	--	--	1,270	--	--	423	2,590
Cottonwood	4,802	3,849	3,493	330	--	--	--	--	26	--	--	179	774
Balsam poplar	11,866	10,227	300	--	--	9,927	--	--	--	--	--	88	1,551
Aspen	400,835	390,022	55,002	3,592	--	316,296	--	--	2,309	--	12,823	6,071	4,742
Paper birch	34,286	32,803	11,487	7,477	--	1,741	--	--	10,869	--	1,229	1,060	423
Other hardwoods	2,910	1,429	1,267	95	--	--	--	--	67	--	--	62	1,419
Total	567,549	525,779	141,155	15,295	308	328,596	--	--	25,955	--	14,470	12,195	29,575
All species	776,437	721,363	245,427	15,308	308	413,451	2,439	1,128	26,769	900	15,633	15,944	39,130

[1]Includes particle board and wafer bolts.

[2]International 1/4-inch rule.

Table 69.--Output of timber products by product, softwoods and hardwoods, and source of material, Minnesota, 1988

Product and species group	Standard units	Total		Roundwood products				Plant byproducts	
				Growing stock		Nongrowing stock			
		Number of units	Thousand cubic feet	Number of units	Thousand cubic feet	Number of units	Thousand cubic feet	Number of units	Thousand cubic feet
Saw logs									
Softwoods	*Thousand board feet*[1]	112,078	20,756	109,060	20,197	3,018	559	--	--
Hardwoods		195,077	34,391	172,927	30,486	22,150	3,905	--	--
Total		307,155	55,147	281,986	50,683	25,169	4,464	--	--
Veneer logs									
Softwoods	*Thousand board feet*[1]	14	2	14	2	--	--	--	--
Hardwoods		16,159	2,611	14,630	2,364	1,529	247	--	--
Total		16,173	2,613	14,644	2,366	1,529	247	--	--
Cooperage									
Softwoods	*Thousand board feet*[1]	--	--	--	--	--	--	--	--
Hardwoods		344	46	307	41	37	5	--	--
Total		344	46	307	41	37	5	--	--
Pulpwood[2]									
Softwoods	*Standard cords*[3]	498,470	39,153	425,914	33,454	72,556	1,712	50,471	3,987
Hardwoods		1,598,637	125,835	1,491,566	117,407	107,071	6,082	29,694	2,346
Total		2,097,107	164,988	1,917,480	150,861	179,627	7,794	80,165	6,333
Piling									
Softwoods	*Pieces*	813	529	813	529	--	--	--	--
Hardwoods		--	--	--	--	--	--	--	--
Total		813	529	813	529	--	--	--	--
Poles									
Softwoods	*Pieces*	66,320	395	65,481	390	839	5	--	--
Hardwoods		--	--	--	--	--	--	--	--
Total		66,320	395	65,481	390	839	5	--	--
Fuelwood									
Softwoods	*Standard cords*[3]	84,473	5,859	6,300	437	78,172	5,422	45,629	3,194
Hardwoods		1,164,415	79,934	204,931	14,068	959,484	65,866	89,857	6,290
Total		1,248,888	85,793	211,231	14,505	1,037,656	71,288	135,486	9,484
Posts									
Softwoods	*Pieces*	3,228	2,584	2,623	2,100	605	484	--	--
Hardwoods		--	--	--	--	--	--	--	--
Total		3,228	2,584	2,623	2,100	605	484	--	--
Miscellaneous									
Softwoods	*Thousand cubic feet*	665	665	360	360	305	305	305	305
Hardwoods		5,310	5,310	2,778	2,778	2,532	2,532	2,532	2,532
Total		5,975	5,975	3,138	3,138	2,837	2,837	2,837	2,837
All products									
Softwoods	*Thousand cubic feet*		69,943		57,469		8,487		7,486
Hardwoods			248,127		167,144		78,637		11,168
Total			318,070		224,613		87,124		18,654

[1]International 1/4-inch rule.

[2]Includes roundwood and plant byproducts for particle boad and waferboard.

[3]128 cubic feet; includes wood, bark, and air space.

Table 70.--Output of roundwood products by product, softwoods and hardwoods, and source of material, Minnesota, 1988

(In thousand cubic feet)

Product and species	All sources	Growing stock			Rough and rotten trees	Salvable dead trees	Other sources
		Total	Sawtimber	Poletimber			
Industrial products							
Saw logs							
Softwoods	20,756	20,197	19,425	772	168	152	239
Hardwoods	34,391	30,486	25,707	4,779	3,520	41	344
Total	55,147	50,683	45,132	5,551	3,688	193	583
Veneer logs							
Softwoods	2	2	2	--	--	--	--
Hardwoods	2,611	2,364	2,364	--	244	--	3
Total	2,613	2,366	2,366	--	244	--	3
Cooperage							
Softwoods	--	--	--	--	--	--	--
Hardwoods	46	41	41	--	3	--	2
Total	46	41	41	--	3	--	2
Pulpwood[1]							
Softwoods	35,166	33,454	22,439	11,015	338	266	1,108
Hardwoods	123,489	117,407	83,083	34,324	4,017	71	1,994
Total	158,655	150,861	105,522	45,339	4,355	337	3,102
Piling							
Softwoods	529	529	448	81	--	--	--
Hardwoods	--	--	--	--	--	--	--
Total	529	529	448	81	--	--	--
Poles							
Softwoods	395	390	365	25	5	--	--
Hardwoods	--	--	--	--	--	--	--
Total	395	390	365	25	5	--	--
Fuelwood							
Softwoods	2,665	437	141	296	81	1,459	688
Hardwoods	73,644	14,068	4,671	9,397	2,632	29,902	27,042
Total	76,309	14,505	4,812	9,693	2,713	31,361	27,730
Posts							
Softwoods	2,584	2,100	479	1,621	321	80	83
Hardwoods	--	--	--	--	--	--	--
Total	2,584	2,100	479	1,621	321	80	83
Miscellaneous							
Softwoods	360	360	203	157	--	--	--
Hardwoods	2,778	2,778	2,020	758	--	--	--
Total	3,138	3,138	2,223	915	--	--	--
All products							
Softwoods	62,457	57,469	43,502	13,967	913	1,957	2,118
Hardwoods	236,959	167,144	117,886	49258	10,416	30,014	29,385
Total	299,416	224,613	161,388	63,225	11,329	31,971	31,503

[1]Includes roundwood and plant byproducts for particle boad and waferboard.

Table 71.--Timber products from roundwood by species group and product, Minnesota, 1988

Species group	All products	Saw logs		Veneer logs		Pulpwood[1]		Poles		Posts		Fuelwood		Other products
	Thousand cubic feet	*Thousand board feet[2]*	*Thousand cubic feet*	*Thousand board feet[2]*	*Thousand cubic feet*	*Cords[3]*	*Thousand cubic feet*	*Pieces*	*Thousand cubic feet*	*Thousand pieces*	*Thousand cubic feet*	*Cords[3]*	*Thousand cubic feet*	*Thousand cubic feet*
Softwoods														
Jack pine	16,646	34,950	7,057	--	--	92,670	7,304	6,800	40	413	329	23,276	1,610	306
Red pine	11,534	42,863	7,387	--	--	26,361	2,080	58,845	352	504	405	10,785	733	577
White pine	3,691	20,096	3,466	14	2	2,061	159	675	3	5	4	897	54	3
Spruce	12,956	7,470	1,505	--	--	145,681	11,420	--	--	--	--	434	30	1
Balsam fir	14,390	4,186	839	--	--	170,513	13,364	--	--	--	--	2,644	185	2
Tamarack	951	253	48	--	--	10,713	839	--	--	15	12	788	52	--
Cedar	2,289	2,260	454	--	--	--	--	--	--	2,291	1,834	20	1	--
Total	62,457	112,078	20,756	14	2	447,999	35,166	66,320	395	3,228	2,584	38,844	2,665	889
Hardwoods														
White oak	10,387	10,121	1,850	158	26	--	--	--	--	--	--	122,939	8,469	42
Red oak	21,448	47,134	8,704	989	158	--	--	--	--	--	--	183,183	12,585	1
Hickory	281	151	22	--	--	--	--	--	--	--	--	3,716	259	--
Basswood	2,897	14,339	2,349	1,769	288	--	--	--	--	--	--	3,899	257	3
Yellow birch	51	304	47	37	4	--	--	--	--	--	--	--	--	--
Hard maple	4,046	1,630	260	62	8	--	--	--	--	--	--	55,105	3,748	30
Soft maple	3,469	2,383	382	364	57	6,359	499	--	--	--	--	36,526	2,480	51
Elm	19,294	8,120	1,316	143	19	--	--	--	--	--	--	258,381	17,959	--
Ash	6,168	9,502	1,541	498	80	2,393	188	--	--	--	--	63,441	4,359	--
Cottonwood	1,533	3,998	641	348	58	--	--	--	--	--	--	11,979	834	--
Balsam poplar	3,704	450	79	--	--	46,109	3,625	--	--	--	--	--	--	--
Aspen	141,935	82,496	14,849	3,796	615	1,500,734	118,128	--	--	--	--	86,025	5,882	2,461
Paper birch	19,933	13,152	2,148	7,896	1,284	13,348	1,049	--	--	--	--	226,426	15,216	236
Walnut	337	736	115	99	14	--	--	--	--	--	--	2,988	208	--
Other hardwoods	1,476	561	88	--	--	--	--	--	--	--	--	19,950	1,388	--
Total	236,959	195,077	34,391	16,159	2,611	1,568,943	123,489	--	--	--	--	1,074,558	73,644	2,824
All species	299,416	307,155	55,147	16,173	2,613	2,016,942	158,655	66,320	395	3,228	2,584	1,113,402	76,309	3,713

[1]Includes roundwood and plant byproducts for particle boad and waferboard.

[2]International 1/4-inch rule.

[3]128 cubic feet; includes wood, bark, and air space.

Table 72.--Volume of primary plant residue by use and type of residue, Minnesota, 1988

(In thousand cubic feet)

Use	Wood residue						Bark	
	Total		Coarse[1]		Fine[2]			
	Softwoods	Hardwoods	Softwoods	Hardwoods	Softwoods	Hardwoods	Softwoods	Hardwoods
Fiber products[3]	3,987	2,346	3,987	2,346	--	--	--	222
Charcoal	2	122	2	122	--	--	1	79
Industrial fuel	2,459	4,128	443	1,994	2,016	2,134	9,043	25,985
Domestic fuel	735	2,172	719	2,108	16	64	305	1,024
Miscellaneous[4]	303	2,410	89	884	214	1,526	63	865
Not used[5]	1,705	3,796	564	1,771	1,142	2,026	5,824	2,322
Total	9,191	14,974	5,804	9,225	3,388	5,750	15,236	30,497

[1] Suitable for chipping such as slabs, edgings, veneer cores, etc.
[2] Not suitable for chipping such as sawdust, veneer clippings, etc.
[3] For manufacture of pulp, hardboard, or roofing felt.
[4] Livestock bedding, mulch, small dimension and specialty items.
[5] Includes residue burned as waste.

Table 73.--All live tree biomass yields on timberland by species group and forest type, Minnesota, 1990

(In pounds per acre)

Species group	Forest type									
	Jack pine	Red pine	White pine	Balsam fir	White spruce	Black spruce	Northern white-cedar	Tamarack	Oak-hickory	Elm-ash-soft maple
Softwoods										
Jack pine	66,603	7,828	3,464	1,263	2,516	1,292	37	209	940	77
Red pine	6,822	83,491	15,152	1,629	1,949	281	82	196	786	32
White pine	1,286	7,613	80,663	1,992	1,858	277	412	307	368	127
White spruce	1,551	2,365	7,329	5,737	42,629	325	645	227	123	1,121
Black spruce	2,177	1,037	1,850	7,292	3,881	59,896	7,546	8,263	--	477
Balsam fir	3,536	5,166	11,115	46,533	10,099	4,001	12,376	1,754	83	5,446
Tamarack	149	236	264	1,677	82	7,471	4,229	49,614	--	911
Eastern redcedar	--	--	--	--	--	29	--	--	1,013	12
Northern white-cedar	12	272	799	5,267	2,440	1,627	79,232	2,442	--	2,602
Other softwoods	729	--	--	--	108	--	--	--	62	--
Total	82,865	108,008	120,636	71,390	65,562	75,199	104,559	63,012	3,375	10,805
Hardwoods										
Select white oak	811	618	1,325	246	147	3	12	58	49,176	3,432
Select red oak	1,440	1,234	3,422	61	--	29	--	188	57,756	556
Other red oak	4	343	--	9	--	--	--	--	4,483	25
Hickory	--	--	--	--	--	--	--	--	2,479	55
Basswood	79	298	76	121	40	--	18	13	5,766	2,964
Yellow birch	--	--	98	314	527	15	683	48	20	831
Hard maple	--	500	1,524	201	68	18	152	41	3,254	1,847
Soft maple	576	1,200	9,981	1,409	2,448	270	151	218	2,576	8,552
Elm	14	148	312	189	191	32	39	336	5,277	6,579
Black ash	37	210	252	2,152	880	216	5,308	466	970	41,634
White and green ash	2	60	685	81	132	--	152	1	2,057	4,977
Cottonwood	--	--	--	--	--	7	--	--	459	2,781
Willow	--	35	--	--	--	--	--	--	112	2,529
Hackberry	--	--	--	--	--	--	--	--	501	422
Balsam poplar	208	531	624	2,758	2,307	252	1,735	593	326	5,080
Bigtooth aspen	882	1,526	223	214	--	44	95	33	1,592	96
Quaking aspen	9,439	9,157	14,605	14,366	14,376	4,338	2,848	1,560	10,148	6,756
Paper birch	4,955	9,782	17,524	14,651	9,860	1,914	8,223	1,474	6,218	4,522
River birch	--	--	112	--	--	--	--	--	8	4
Black cherry	48	30	54	8	24	7	6	1	1,116	183
Black walnut	--	--	--	--	--	--	--	--	921	243
Butternut	--	--	--	--	--	--	--	--	1,036	54
Other hardwoods	6	1	--	--	--	5	--	11	1,890	6,782
Noncommercial sp.	67	145	248	292	508	12	156	22	2,267	455
Total	18,568	25,818	51,065	37,072	31,508	7,162	19,578	5,063	160,408	101,359
All species	101,433	133,826	171,701	108,462	97,070	82,361	124,137	68,075	163,783	112,164

(Table 73 continued on next page)

(Table 73 continued)

Species group	Forest type				
	Maple-basswood	Aspen	Paper birch	Balsam poplar	Non-stocked
Softwoods					
Jack pine	165	959	856	160	45
Red pine	414	1,219	1,798	292	--
White pine	1,496	747	1,733	95	--
White spruce	732	1,361	2,152	1,447	34
Black spruce	115	862	784	352	49
Balsam fir	2,608	6,981	12,409	7,543	195
Tamarack	31	264	387	953	792
Eastern redcedar	267	19	77	--	--
Northern white-cedar	809	498	1,870	1,812	105
Other softwoods	--	8	--	--	--
Total	6,637	12,918	22,066	12,654	1,220
Hardwoods					
Select white oak	9,660	3,316	1,679	457	117
Select red oak	9,811	3,589	4,883	485	45
Other red oak	376	86	206	71	--
Hickory	438	13	152	--	--
Basswood	29,040	1,953	1,648	450	--
Yellow birch	1,967	60	239	92	--
Hard maple	37,155	1,806	3,587	620	--
Soft maple	10,122	4,158	6,269	487	182
Elm	10,281	1,304	1,418	1,427	47
Black ash	5,056	2,406	3,653	6,250	475
White and green ash	8,015	520	303	228	75
Cottonwood	351	39	10	--	101
Willow	421	44	27	41	6
Hackberry	423	2	--	--	--
Balsam poplar	1,496	5,024	2,937	58,667	1,307
Bigtooth aspen	1,404	4,198	1,645	42	--
Quaking aspen	10,199	66,454	19,029	15,812	889
Paper birch	10,056	11,276	72,910	4,774	433
River birch	5	--	--	--	--
Black cherry	677	96	174	56	43
Black walnut	120	4	10	--	--
Butternut	221	31	40	--	--
Other hardwoods	2,261	126	40	72	--
Noncommercial sp.	3,104	464	1,079	237	71
Total	152,659	106,969	121,938	90,268	3,791
All species	159,296	119,887	144,004	102,922	5,011

Table 74.--All live tree biomass on timberland by species group and forest type, Minnesota, 1990

(In green tons)

Species group	Forest type								
	All types	Jack pine	Red pine	White pine	Balsam fir	White spruce	Black spruce	Northern white-cedar	Tamarack
Softwoods									
Jack pine	21,285,064	14,902,517	1,180,456	109,463	463,776	117,980	853,996	12,723	73,627
Red pine	20,274,909	1,526,453	12,590,399	478,814	597,948	91,393	185,898	27,881	69,083
White pine	9,237,770	287,764	1,147,992	2,548,935	731,464	87,127	182,902	140,111	108,258
White spruce	11,556,681	347,072	356,651	231,589	2,106,202	1,999,310	214,956	219,328	80,040
Black spruce	51,637,113	487,200	156,376	58,454	2,677,126	181,996	39,594,384	2,567,474	2,913,225
Balsam fir	57,016,057	791,267	778,960	351,245	17,084,489	473,646	2,645,079	4,210,782	618,528
Tamarack	26,283,461	33,444	35,658	8,336	615,613	3,860	4,938,825	1,438,937	17,491,473
Eastern redcedar	893,701	--	--	--	--	--	19,306	--	--
Northern white-cedar	35,709,292	2,652	41,017	25,259	1,933,707	114,446	1,075,389	26,958,845	860,759
Other softwoods	224,399	163,151	--	--	--	5,060	--	--	--
Total	234,118,447	18,541,520	16,287,509	3,812,095	26,210,325	3,074,818	49,710,735	35,576,081	22,214,993
Hardwoods									
Select white oak	47,841,320	181,398	93,255	41,857	90,338	6,903	2,177	4,148	20,376
Select red oak	53,491,934	322,238	186,022	108,131	22,552	--	19,010	--	66,416
Other red oak	3,310,678	912	51,683	--	3,363	--	--	--	--
Hickory	1,906,185	--	--	--	--	--	--	--	--
Basswood	31,600,421	17,718	44,915	2,405	44,296	1,874	--	6,062	4,619
Yellow birch	2,604,272	--	--	3,103	115,250	24,710	9,888	232,439	16,802
Hard maple	35,709,755	--	75,458	48,145	73,742	3,210	11,649	51,750	14,553
Soft maple	29,083,865	128,943	180,888	315,385	517,327	114,804	178,276	51,321	76,900
Elm	19,087,369	3,150	22,384	9,847	69,416	8,978	21,199	13,362	118,420
Black ash	43,054,388	8,354	31,656	7,970	790,268	41,268	142,565	1,806,081	164,244
White and green ash	11,684,912	356	9,007	21,637	29,582	6,169	--	51,730	357
Cottonwood	2,429,828	--	--	--	--	--	4,376	--	--
Willow	2,133,735	--	5,309	--	--	--	--	--	--
Hackberry	870,490	--	--	--	--	--	--	--	--
Balsam poplar	33,486,955	46,612	80,087	19,709	1,012,632	108,205	166,606	590,474	209,107
Bigtooth aspen	14,007,748	197,421	230,190	7,033	78,593	--	28,868	32,225	11,667
Quaking aspen	213,155,012	2,112,009	1,380,807	461,513	5,274,297	674,254	2,867,604	969,131	549,996
Paper birch	87,579,782	1,108,591	1,475,197	553,771	5,379,219	462,444	1,265,553	2,797,858	519,598
River birch	14,293	--	--	3,536	--	--	--	--	--
Black cherry	1,615,281	10,661	4,505	1,703	2,968	1,136	4,498	2,202	280
Black walnut	799,394	--	--	--	--	--	--	--	--
Butternut	900,086	--	--	--	--	--	--	--	--
Other hardwoods	7,447,681	1,368	79	--	157	--	2,991	134	3,944
Noncommercial sp.	5,750,672	14,945	21,877	7,822	107,244	23,814	7,643	52,920	7,666
Total	649,566,056	4,154,676	3,893,319	1,613,567	13,611,244	1,477,769	4,732,903	6,661,837	1,784,945
All species	883,684,503	22,696,196	20,180,828	5,425,662	39,821,569	4,552,587	54,443,638	42,237,918	23,999,938

(Table 74 continued on next page)

(Table 74 continued)

Species group	Forest type						
	Oak-hickory	Elm-ash-soft maple	Maple-basswood	Aspen	Paper birch	Balsam poplar	Non-stocked
Softwoods							
Jack pine	556,813	50,034	115,548	2,452,448	357,728	34,129	3,826
Red pine	465,405	20,843	290,677	3,116,328	751,332	62,455	--
White pine	217,731	81,905	1,049,565	1,909,325	724,380	20,311	--
White spruce	73,012	724,050	513,579	3,479,180	899,452	309,386	2,874
Black spruce	--	308,217	80,671	2,204,952	327,704	75,184	4,150
Balsam fir	49,142	3,516,727	1,829,257	17,851,647	5,185,680	1,613,121	16,487
Tamarack	--	588,530	21,825	674,685	161,577	203,848	66,850
Eastern redcedar	599,891	7,631	187,172	47,484	32,217	--	--
Northern white-cedar	--	1,680,072	567,415	1,272,158	781,304	387,427	8,842
Other softwoods	36,861	--	--	19,327	--	--	--
Total	1,998,855	6,978,009	4,655,709	33,027,534	9,221,374	2,705,861	103,029
Hardwoods							
Select white oak	29,119,779	2,216,386	6,775,861	8,479,301	701,851	97,825	9,865
Select red oak	34,200,498	359,345	6,881,741	9,177,794	2,040,624	103,799	3,764
Other red oak	2,654,340	15,927	264,074	219,097	86,030	15,252	--
Hickory	1,467,917	35,295	307,315	32,169	63,489	--	--
Basswood	3,414,277	1,914,042	20,370,267	4,995,196	688,494	96,256	--
Yellow birch	11,933	536,706	1,379,533	154,587	99,711	19,610	--
Hard maple	1,926,935	1,192,797	26,062,114	4,617,985	1,498,860	132,557	--
Soft maple	1,525,180	5,522,206	7,099,981	10,633,540	2,619,679	104,044	15,391
Elm	3,125,017	4,248,701	7,211,697	3,333,507	592,655	305,068	3,968
Black ash	574,373	26,884,876	3,546,640	6,152,816	1,526,697	1,336,501	40,079
White and green ash	1,218,249	3,214,102	5,622,278	1,329,689	126,543	48,842	6,371
Cottonwood	271,958	1,796,097	246,108	98,681	4,097	--	8,511
Willow	66,127	1,633,062	295,208	113,335	11,382	8,781	531
Hackberry	296,868	272,802	296,503	4,317	--	--	--
Balsam poplar	192,863	3,280,149	1,049,085	12,847,680	1,227,528	12,545,863	110,355
Bigtooth aspen	942,850	61,866	985,018	10,735,468	687,629	8,920	--
Quaking aspen	6,009,323	4,362,941	7,153,903	169,930,719	7,952,067	3,381,373	75,075
Paper birch	3,681,709	2,920,120	7,054,087	28,835,126	30,469,039	1,020,869	36,601
River birch	4,633	2,643	3,481	--	--	--	--
Black cherry	660,832	117,854	474,618	245,724	72,582	12,076	3,642
Black walnut	545,546	156,820	83,886	8,961	4,181	--	--
Butternut	613,572	34,748	155,194	79,732	16,840	--	--
Other hardwoods	1,119,049	4,379,202	1,586,021	322,457	16,821	15,458	--
Noncommercial sp.	1,342,145	294,001	2,177,493	1,185,505	450,818	50,785	5,994
Total	94,985,973	65,452,688	107,082,106	273,533,386	50,957,617	19,303,879	320,147
All species	96,984,828	72,430,697	111,737,815	306,560,920	60,178,991	22,009,740	423,176

Table 75.--All live tree biomass on timberland by species group and tree biomass component, Minnesota, 1990

(In green tons)

Species group	All components	All live 1- 5-inch trees	Biomass component					
			Growing-stock trees			Nongrowing-stock trees		
			Stumps	Boles	Tops and limbs	Stumps	Boles	Tops and limbs
Softwoods								
Jack pine	21,285,064	2,354,273	1,100,803	15,193,018	1,814,237	49,820	691,114	81,799
Red pine	20,274,909	1,482,568	1,005,663	15,804,212	1,779,060	11,339	172,599	19,468
White pine	9,237,770	414,125	430,313	7,087,628	742,704	33,377	477,041	52,582
White spruce	11,556,681	1,266,708	688,332	7,438,349	1,988,205	12,781	125,809	36,497
Black spruce	51,637,113	23,183,426	1,894,557	19,455,678	6,569,405	36,666	372,630	124,751
Balsam fir	57,016,057	18,284,485	2,832,302	26,499,680	8,298,218	80,735	785,470	235,167
Tamarack	26,283,461	7,245,077	1,284,740	14,505,673	1,869,801	97,037	1,140,164	140,969
Eastern redcedar	893,701	257,706	33,010	369,948	113,129	8,247	84,797	26,864
Northern white-cedar	35,709,292	6,479,213	2,155,842	15,689,203	4,546,391	638,741	4,841,305	1,358,597
Other softwoods	224,399	39,102	9,375	103,611	26,498	3,480	32,479	9,854
Total	234,118,447	61,006,683	11,434,937	122,147,000	27,747,648	972,223	8,723,408	2,086,548
Hardwoods								
Select white oak	47,841,320	3,137,781	2,218,383	23,401,048	7,302,672	738,734	8,635,976	2,406,726
Select red oak	53,491,934	906,425	2,481,885	31,638,699	9,459,453	491,979	6,674,851	1,838,642
Other red oak	3,310,678	52,313	121,100	1,449,829	429,255	72,197	936,437	249,547
Hickory	1,906,185	268,234	85,941	957,962	321,047	15,798	196,903	60,300
Basswood	31,600,421	2,707,731	1,477,688	17,698,036	5,633,352	234,615	2,978,280	870,719
Yellow birch	2,604,272	173,223	73,082	821,937	250,446	78,423	941,729	265,432
Hard maple	35,709,755	4,555,967	1,205,988	15,122,402	5,157,186	502,650	7,015,342	2,150,220
Soft maple	29,083,865	5,872,401	923,240	11,316,743	3,994,487	375,067	4,988,230	1,613,697
Elm	19,087,369	3,098,710	891,302	8,978,729	2,893,748	218,220	2,298,583	708,077
Black ash	43,054,388	9,373,899	2,259,583	21,046,386	7,489,316	204,395	1,999,770	681,039
White and green ash	11,684,912	1,250,883	464,687	5,810,579	1,854,269	125,752	1,679,696	499,046
Cottonwood	2,429,828	23,813	129,936	1,631,043	384,670	14,652	204,291	41,423
Willow	2,133,735	29,594	83,868	861,553	251,315	59,860	674,102	173,443
Hackberry	870,490	225,130	30,483	316,191	104,208	12,760	138,329	43,389
Balsam poplar	33,486,955	3,691,731	1,165,623	19,358,893	6,526,088	115,831	1,981,203	647,586
Bigtooth aspen	14,007,748	729,232	456,718	8,611,963	2,084,349	83,632	1,664,670	377,184
Quaking aspen	213,155,012	25,301,934	7,596,811	118,860,372	29,649,362	1,478,437	24,540,820	5,727,276
Paper birch	87,579,782	9,904,510	3,722,362	48,200,568	17,238,441	447,696	6,028,492	2,037,713
River birch	14,293	4,287	146	1,240	506	384	6,146	1,584
Black cherry	1,615,281	419,211	35,454	455,348	157,498	30,269	381,207	136,294
Black walnut	799,394	25,618	33,085	468,480	142,208	6,290	96,172	27,541
Butternut	900,086	46,379	21,885	307,835	95,025	22,202	312,462	94,298
Other hardwoods	7,447,681	1,024,234	145,480	1,500,847	513,947	268,183	3,053,674	941,316
Noncommercial sp.	5,750,672	4,054,751	--	--	--	131,713	1,111,977	452,231
Total	649,566,056	76,877,991	25,624,730	338,816,683	101,932,848	5,729,739	78,539,342	22,044,723
All species	883,684,503	137,884,674	37,059,667	460,963,683	129,680,496	6,701,962	87,262,750	24,131,271

Table 76.--All live tree biomass on timberland by species group and tree biomass component, Minnesota, 1990

(In thousand cubic feet)

Species group	All components	All live 1- 5-inch trees	Biomass component					
			Growing-stock trees			Nongrowing-stock trees		
			Stumps	Boles	Tops and limbs	Stumps	Boles	Tops and limbs
Softwoods								
Jack pine	925,987	102,604	47,935	660,787	78,889	2,149	30,063	3,560
Red pine	879,104	66,352	43,525	683,502	76,927	498	7,463	837
White pine	408,899	18,530	19,042	313,565	32,846	1,473	21,109	2,334
White spruce	513,647	57,205	30,553	329,917	88,207	564	5,583	1,618
Black spruce	2,288,180	1,027,037	83,956	862,308	291,211	1,623	16,513	5,532
Balsam fir	2,431,653	780,447	120,774	1,129,773	353,703	3,453	33,483	10,020
Tamarack	1,010,433	286,319	48,810	551,756	71,130	3,680	43,367	5,371
Eastern redcedar	41,924	12,114	1,547	17,344	5,298	386	3,974	1,261
Northern white-cedar	1,971,699	357,446	118,986	866,449	251,146	35,305	267,356	75,011
Other softwoods	10,226	1,778	426	4,721	1,209	158	1,483	451
Total	10,481,752	2,709,832	515,554	5,420,122	1,250,566	49,289	430,394	105,995
Hardwoods								
Select white oak	1,647,361	108,082	76,390	805,763	251,447	25,477	297,338	82,864
Select red oak	1,662,471	28,157	77,167	983,290	293,979	15,290	207,454	57,134
Other red oak	102,767	1,626	3,755	45,001	13,331	2,238	29,066	7,750
Hickory	61,817	8,721	2,797	31,018	10,416	512	6,395	1,958
Basswood	1,499,081	129,964	70,008	838,659	266,941	11,133	141,120	41,256
Yellow birch	85,070	5,643	2,393	26,851	8,180	2,571	30,762	8,670
Hard maple	1,137,637	145,258	38,413	481,697	164,302	16,042	223,449	68,476
Soft maple	1,051,146	212,013	33,384	409,120	144,391	13,574	180,327	58,337
Elm	698,327	117,479	32,366	326,181	105,152	7,924	83,500	25,725
Black ash	1,722,342	375,107	90,379	841,873	299,587	8,147	79,998	27,251
White and green ash	457,414	50,155	18,183	226,778	72,354	4,887	65,573	19,484
Cottonwood	94,970	932	5,095	63,727	15,040	567	7,985	1,624
Willow	89,292	1,241	3,518	36,047	10,517	2,497	28,209	7,263
Hackberry	33,388	8,630	1,164	12,137	3,995	489	5,308	1,665
Balsam poplar	1,271,880	142,113	44,223	734,019	247,463	4,392	75,120	24,550
Bigtooth aspen	559,108	29,410	18,219	343,538	83,153	3,325	66,410	15,053
Quaking aspen	8,514,584	1,020,863	302,954	4,741,579	1,182,747	59,030	978,945	228,466
Paper birch	3,210,977	363,194	136,499	1,767,156	631,998	16,414	221,005	74,711
River birch	525	158	5	45	19	15	225	58
Black cherry	65,645	17,002	1,448	18,516	6,402	1,235	15,504	5,538
Black walnut	29,870	1,003	1,236	17,476	5,305	233	3,588	1,029
Butternut	40,194	2,072	971	13,752	4,244	992	13,954	4,209
Other hardwoods	322,912	44,411	6,336	65,065	22,270	11,637	132,396	40,797
Noncommercial sp.	230,071	162,226	--	--	--	5,275	44,482	18,088
Total	24,588,849	2,975,460	966,903	12,829,288	3,843,233	213,896	2,938,113	821,956
All species	35,070,601	5,685,292	1,482,457	18,249,410	5,093,799	263,185	3,368,507	927,951

Table 77.--All live shrub[1] and tree seedling biomass yields on timberland by species group and forest type, Minnesota, 1990

(In pounds per acre green weight)

Species group	All types	Forest type														
		Jack pine	Red pine	White pine	Balsam fir	White spruce	Black spruce	Northern white-cedar	Tamarack	Oak-hickory	Elm-ash-soft maple	Maple-basswood	Aspen	Paper birch	Balsam poplar	Non-stocked
Commercial tree species																
Jack pine	3	62	--	--	--	--	--	--	--	--	19	--	--	--	--	--
Red pine	1	--	--	--	--	--	--	--	--	--	--	--	--	17	--	--
White pine	1	--	4	16	--	--	--	--	--	--	--	1	--	--	11	--
Ponderosa pine	--	6	--	--	--	--	--	--	--	--	--	--	--	--	--	--
White spruce	3	--	5	--	43	--	--	11	--	--	--	--	--	--	--	--
Black spruce	67	--	--	65	--	--	581	60	100	--	30	--	--	2	--	--
Balsam fir	251	123	52	132	2,347	25	154	631	14	--	235	47	45	947	173	--
Tamarack	11	--	--	--	10	--	37	1	187	--	--	--	--	--	--	--
Northern white-cedar	37	--	--	--	12	--	--	466	262	--	--	--	--	4	--	--
Select white oak	32	6	--	--	--	--	--	--	--	570	--	12	15	--	--	--
Select red oak	13	7	12	--	--	--	--	--	--	98	--	12	18	--	--	--
Other hickory	1	--	--	--	--	--	--	--	--	--	--	7	--	--	--	--
Basswood	14	--	--	--	--	--	--	--	--	67	1	71	9	29	--	--
Yellow birch	--	--	--	--	--	--	--	--	--	--	3	--	--	2	2	--
Hard maple	68	--	--	--	--	--	--	--	--	2	16	594	31	23	--	--
Soft maple	31	10	23	149	5	--	4	--	--	14	3	151	19	138	1	--
Elm	34	--	5	--	1	--	--	--	--	414	67	33	6	142	4	--
Black ash	121	--	1	--	88	--	--	22	2	25	891	31	107	28	168	--
White & green ash	12	1	--	--	--	--	--	--	--	11	5	49	13	33	--	--
Willow	4	1	--	--	--	--	32	--	--	--	--	--	2	--	--	--
Balsam poplar	78	19	1	--	452	--	--	3	14	--	41	2	81	12	500	--
Bigtooth aspen	2	--	--	--	--	--	--	--	--	--	--	1	5	--	--	--
Quaking aspen	227	60	20	--	46	--	1	3	35	90	62	96	435	365	120	--
Paper birch	90	60	1	79	565	--	6	21	4	2	7	5	47	890	9	--
Black cherry	5	4	5	--	--	--	--	--	--	30	1	14	4	1	2	--
Other hardwoods	973	947	895	26	886	446	2,030	1,351	1,213	442	1,367	153	815	511	1,970	3,851
Non-commercial species																
Mountain maple	70	7	63	--	90	--	--	89	--	30	49	86	58	502	22	5
American hornbeam	3	--	--	--	--	--	--	--	--	--	--	30	2	--	--	--
Eastern hophornbeam	18	--	--	--	--	--	--	--	--	32	2	124	11	24	--	--
Pincherry	6	7	33	--	--	--	--	--	--	1	--	1	11	2	5	--
Chokecherry	24	27	32	1	--	--	--	--	1	38	56	35	24	52	35	--
Mountain ash	11	--	--	--	1	--	1	183	--	6	--	--	--	--	--	--
Noncommercial willow	1	--	--	--	--	--	--	--	--	--	--	--	--	--	20	--
Green alder	5	--	--	--	56	--	4	--	--	--	--	--	--	45	--	--
Speckled alder	15	--	--	--	54	--	4	27	18	--	--	--	16	76	--	--
Swamp birch	10	--	--	--	--	--	22	--	125	--	--	35	--	1	--	--
Dogwood	1	--	--	--	7	--	--	--	4	1	--	--	2	--	--	--
Shrub species																
Witch hazel	5	--	15	--	6	--	--	--	--	14	9	1	7	4	--	--
Common ninebark	--	1	--	--	--	--	--	--	--	--	--	--	--	--	1	--
Juneberry	99	38	57	8	3	5	2	7	--	43	4	9	208	106	12	--
Hazel	225	284	212	8	56	--	5	15	19	153	167	78	351	729	72	--
Prickly ash	11	--	--	1	--	--	--	--	--	213	--	12	2	1	--	--
Alder buckthorn	6	--	--	--	--	--	--	--	4	102	17	5	--	--	--	--
Leatherwood	2	--	--	--	--	--	--	--	--	--	--	14	1	1	--	--
Viburnum	9	--	--	--	--	--	--	--	--	11	35	--	13	1	7	--
Elder	5	--	--	594	--	--	--	--	--	--	--	14	2	--	3	--
Sumac	3	--	--	--	--	--	--	--	--	59	--	--	--	7	--	--
Shrubby willows	6	55	--	--	2	--	1	--	4	--	24	--	6	--	--	--
Misc. tall shrubs	69	5	13	--	3	--	11	99	29	62	13	65	114	41	51	76
Total species	2,683	1,730	1,449	1,079	4,733	476	2,895	2,989	2,035	2,530	3,124	1,788	2,480	4,736	3,188	3,932

[1] Includes trees less than 1.0 inch d.b.h.

(Table 77 continued on next page)

(Table 77 continued)

Species group	Forest type																
	All types	Jack pine	Red pine	White pine	Balsam fir	White spruce	Black spruce	Northern white-cedar	Tamarack	Oak-hickory	Elm-ash-soft maple	Maple-basswood	Aspen	Paper birch	Balsam poplar	Non-stocked
Shrub species																
Virginia creeper	1	--	--	14	--	--	--	--	--	9	1	4	1	--	1	--
Labrador tea	11	--	--	--	11	--	61	26	51	--	1	--	1	--	1	7
Leatherleaf	1	--	--	--	--	--	3	--	5	--	--	--	--	2	--	--
Bog laurel	1	--	--	--	--	--	5	--	13	--	--	--	--	1	--	--
Sweetfern	1	1	8	--	--	--	--	--	--	--	1	1	1	1	1	--
Gooseberry-current	4	1	--	--	1	3	--	5	1	21	6	6	3	2	8	3
Raspberry-blackberry	12	12	10	11	3	1	2	16	4	5	16	6	17	17	8	4
Rose	2	8	8	2	3	--	--	--	1	--	1	1	3	2	3	--
Bilberry-blueberry	6	28	12	9	16	1	15	1	14	--	1	1	4	16	--	--
Bush honeysuckle	3	11	7	6	2	--	--	--	1	--	--	1	4	5	--	--
Honeysuckle	3	8	16	--	2	5	--	2	--	1	3	1	3	3	--	--
Poison ivy	3	6	--	--	--	--	--	1	--	4	3	4	4	5	--	--
Bog rosemary	--	--	--	--	--	--	--	--	3	--	--	--	--	--	--	--
Grape	--	--	--	--	--	--	--	--	--	2	2	--	--	--	--	--
Strawberry	6	7	10	2	5	1	1	5	4	3	8	5	7	8	6	--
Misc. low shrubs	201	294	320	28	268	151	193	307	185	82	213	137	190	239	233	162
Total shrubs	255	376	391	72	311	162	280	363	282	127	256	167	238	301	261	176
All species	2,937	2,106	1,840	1,151	5,045	636	3,13	7,166	9,483	2,658	3,380	1,955	2,717	7,754	3449	4,109

Table 78.--Sampling errors for Forest Survey Unit and county totals of volume, net annual growth, average annual removals, and area of timberland, Minnesota, 1990

(In percent)

Unit and county	Area	Growing stock			Sawtimber		
		Volume	Growth	Removals	Volume	Growth	Removals
Aspen-Birch Unit							
Carlton	2.39	4.57	7.09	47.95	7.60	9.36	77.37
Cook	1.85	3.07	6.27	30.10	4.52	6.94	36.69
Koochiching	1.17	2.29	3.79	18.30	3.81	4.87	25.86
Lake	1.51	2.79	5.01	27.80	4.28	5.72	41.78
St. Louis	0.85	1.62	2.78	15.86	2.50	3.12	22.27
Total	0.57	1.08	1.87	10.10	1.69	2.19	14.15
Northern Pine Unit							
Aitkin	1.42	3.02	4.35	19.86	4.13	5.25	20.61
Becker	2.08	4.07	7.09	29.71	5.39	7.39	31.82
Beltrami	1.31	2.76	4.29	13.71	3.78	4.84	14.65
Cass	1.31	2.56	3.92	13.24	3.33	4.19	15.63
Clearwater	2.23	4.47	6.58	26.64	6.13	7.52	31.02
Crow Wing	1.93	3.83	5.38	20.21	5.16	5.88	22.93
Hubbard	1.90	3.91	5.34	19.23	5.46	6.34	23.48
Itasca	1.04	2.19	3.49	9.67	2.83	3.66	10.81
Lake of the Woods	1.90	4.76	6.83	35.75	7.23	8.83	38.46
Mahnomen	3.55	7.12	11.82	48.90	10.55	13.53	55.99
Roseau	2.57	6.58	8.88	56.62	9.38	12.46	59.64
Wadena	3.48	8.58	9.94	43.74	11.99	12.85	47.31
Total	0.49	1.03	1.55	5.42	1.38	1.74	6.07
Central Hardwood Unit							
Anoka-Dakota-Ramsey-Washington	5.80	14.05	26.97	106.17	17.29	29.74	138.27
Benton-Sherburne	5.27	13.12	25.86	66.30	17.68	24.65	73.56
Carver-Hennepin-Scott	7.26	16.29	36.42	251.85	18.20	33.04	280.55
Chisago-Isanti	4.80	11.74	25.63	53.50	16.28	30.91	54.78
Douglas-Todd	4.28	9.78	36.31	60.36	12.09	25.11	66.01
Fillmore-Olmsted	4.12	8.69	23.24	41.61	10.10	20.12	38.32
Goodhue	5.84	11.47	40.23	42.44	13.06	27.34	42.76
Houston	4.20	8.97	22.75	42.64	10.44	19.18	39.75
Kanabec	4.08	9.65	19.94	40.04	13.82	20.64	51.44
LeSueur-Rice	7.39	15.80	37.44	85.45	17.57	43.44	107.95
Mille Lacs	4.14	9.25	20.36	49.34	13.65	21.44	66.25
Morrison	3.77	7.89	16.26	31.89	11.43	16.02	40.57
Otter Tail	3.37	7.84	23.26	29.95	10.28	18.77	35.54
Pine	2.21	5.16	10.92	24.28	8.00	11.44	30.95
Stearns	5.85	14.13	57.16	69.80	17.87	40.89	75.44
Wabasha	5.90	12.85	35.47	50.77	15.34	28.97	47.02
Winona	4.31	8.85	24.01	34.39	10.20	20.33	31.55
Wright	6.85	17.45	51.86	79.80	19.81	47.60	92.42
Total	1.18	2.64	6.27	11.42	3.51	5.96	12.84

(Table 78 continued on next page)

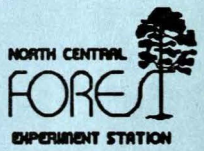
(Table 78 continued)

Unit and county	Area	Growing stock			Sawtimber		
		Volume	Growth	Removals	Volume	Growth	Removals
Prairie Unit							
Blue Earth-Faribault	10.59	14.99	33.25	121.30	17.50	43.32	105.73
Clay-Norman	9.65	13.75	42.90	43.04	18.39	38.55	41.92
Eastern Group	10.17	13.73	35.53	59.46	15.54	35.00	51.69
Kandiyohi-Meeker	9.48	14.80	35.73	374.51	17.09	37.14	271.76
Kittson	8.15	14.97	31.57	115.03	30.82	69.29	355.82
Marshall	5.08	11.26	20.73	39.85	22.34	37.85	74.23
Northern Group	7.28	12.61	36.15	65.80	14.63	38.64	54.81
Pennington-Red Lake	15.76	26.11	55.97	97.58	40.79	69.23	117.76
Polk	9.36	15.92	38.52	132.41	18.50	55.41	125.48
Southern Group	6.62	14.14	31.65	66.14	17.42	34.63	55.11
Western Group	2.36	4.11	9.38	17.10	5.51	11.80	18.15
Total	1.67	2.91	6.63	12.09	3.90	8.34	12.83
All counties	0.36	0.71	1.30	4.86	1.02	1.45	6.03

*U.S. GOVERNMENT PRINTING OFFICE: 1992- 657- 527/60228

Miles, Patrick D.; Chen, Chung M.
1992. **Minnesota forest statistics, 1990.** Resour. Bull. NC-141. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 130 p.

The fifth inventory of Minnesota's forests reports 51.0 million acres of land, of which 16.7 million acres are forested. This bulletin presents statistical highlights and contains detailed tables of forest area, as well as timber volume, growth, removals, mortality, and ownership.

KEY WORDS: Forest area, timber volume, growth, removals, mortality.

Our job at the North Central Forest Experiment Station is discovering and creating new knowledge and technology in the field of natural resources and conveying this information to the people who can use it. As a new generation of forests emerges in our region, managers are confronted with two unique challenges: (1) Dealing with the great diversity in composition, quality, and ownership of the forests, and (2) Reconciling the conflicting demands of the people who use them. Helping the forest manager meet these challenges while protecting the environment is what research at North Central is all about.